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Contents:

	PAGE
The I.M.E.A. at Buxton	825
Cheap Electricity for Farming	826
The Importance of Distribution	826
The Generation of Electricity Statistics	826
The "Electrical Retailer" Supplement	826
Electro-Farming, by R. Borlase Matthews (*illus.*)	827
Mains Engineers' Problems, by D. P. Sayers	829
Electricity Supply in Carlisle (*illus.*)	831
The Incorporated Municipal Electrical Association (*illus.*)	833
The Royal Society's Soirée	836
Legal	837
Business and Industrial Notes	838
Lighting and Power Notes	842
Tramway and Railway Notes	844
Telegraph and Telephone Notes	844
Radio Notes	844
Contract Information	845
Forthcoming Events	847
Notes	847
Institution Notes	849
Our Personal Column	849
Financial Section—	
New Companies Registered	850
Official Returns of Electrical Companies	850
Financial Section—*continued.*	
City Notes	851
Stocks and Shares	853
French Foreign Electrical Trade	855
The Electrical Imports of Egypt	856
Electricity Supply in Gt. Britain	856
Metal-Clad Draw-out Switchgear, by Thomas Carter	857
Electricity Tariffs, by A. Ekstrom (*illus.*)	859
Selected Radio-Telephone Apparatus (*illus.*)	861
The "Electrolux" Refrigerator (*illus.*)	862
Parliamentary News	863
Neon Electric Signs (*illus.*)	865
Correspondence—	
The Ideal Wiring System	865
Safety First: Earthing Transmission-line Towers	865
Sheath Losses in Cables	865
Electric Power in Agriculture	866
The Adequate Distribution of Electricity	866
A Commutation Problem	866
A Mysterious Occurrence	866
Cheap Electricity	866
Balancing Loads on Three-phase Services	867
Trade-mark Applications	867
Published Specifications	867
New Work for Contractors	868

The I.M.E.A. at Buxton.

GIVEN fair weather, such as we have been favoured with during the past month, the members of the Incorporated Municipal Electrical Association should find their gathering at Buxton particularly enjoyable; this year the technical programme is comparatively light, the meeting-place all that could be desired, and the omens wholly favourable. We look forward, therefore, to a highly successful Convention, though our sympathies may be extended to the President, Mr. R. W. L. Phillips, whose own town does not possess the accommodation necessary for some 900 visitors (we understand that the attendance this year will beat all previous records).

Let it not be supposed, however, that the meeting is merely a holiday occasion; in addition to the presidential address, there will be three papers to discuss, and various business meetings to be held. Mr. W. C. Bexon, chief engineer of the Ayrshire Electricity Board, will treat of "Methods and Capital Costs of Distribution over an Extensive Area," a subject on which he is an authority, for he has developed a remarkable distribution system linking-up several towns and supplying electricity to country dwellers. Mr. T. Roles, city electrical engineer, Bradford, will deal with "Recent Developments in Power Plant Design and their Effects on the Economy of Generation," matters of which he has made a special study, with the result that he is making a new departure (so far as this country is concerned) in the latest extensions of his plant. Lastly, Mr. H. H. Berry will read a paper on "Electrified Homes of Great Britain and Ireland, with special reference to the Heating Question"; we know that the author has very definite and original views on this subject, and that they will be found well worthy of careful consideration. The papers form a very appropriate and useful trio, raising questions of interest in relation to generation, distribution, and consumption, and with the discussions should furnish information of immediate and lasting value to station engineers and managers.

Further, it appears from the information that we have already collected that the exhibition of electrical apparatus, which gains in interest at each Convention, will this year again challenge past records. We look forward, therefore, to a Convention which will fully maintain the reputation of the I.M.E.A. for efficiency and usefulness, wisely combined with relaxation and social amenity.

Cheap Electricity for Farming.

IN *The Times* and *Morning Post* recently Col. R. E. Crompton, R.E., has drawn attention to the necessity of reversing the flow of population by giving to our farms and villages a "cheap and abundant" supply of electricity, so that the land can be cultivated with greater efficiency at reduced cost and village industries can be established, enabling rural workers to employ their time profitably when weather or season puts a stop to outdoor occupations. He adduces the examples of Sweden and Switzerland in support of his case, and emphasises the great importance of the subject, pointing out that, with the aid of electric power, the useful output of the Swedish labourer has been doubled and the rate of wages in agriculture has been raised to the same level as in other industries.

We are glad to have the support of Col. Crompton—the first to use the term "load factor"—in our contention that filling up the load curve is the most urgent need; in his own words, "there is only one certain way of distributing electricity at low cost, and that is by prolonging as far as possible the hours of user. Technically, we term this increasing the off-peak load." We are not quite so optimistic as he appears to be with regard to the Central Scotland scheme, which, he says, makes accessible to large districts of the best agricultural land in Scotland electrical energy at exceptionally low rates; we shall hope to see that end attained some five years hence, but it cannot be, as he says, "soon." Nevertheless, on the general question of rural electricity supply we agree with him that it can be done, and we base this conclusion on the indisputable fact that in some of our country districts electricity is already available at reasonable prices and is cordially welcomed by the residents. Replying to Col. Crompton in *The Times*, Mr. W. W. Blair-Fish, director of the Rural Industries Bureau, in doleful mood pours cold water on his cheerful forecast, appropriately quoting Mr. Dampier Whetham to the same effect; but that gentleman for some years has held somewhat pessimistic views on the subject of electric power in agriculture. The rapid development of rural electricity supply not only in Sweden and Switzerland, but also in France, Germany, Denmark, Holland, and Italy, cannot always be ignored, and a time must come when even our unbelievers realise the facts. So recently as last week, visiting the Bedford Corporation undertaking, it was borne in upon us once more that the country folk needed electricity, were getting it, and were extremely glad to have it.

The Importance of Distribution.

IN a letter to-day in our "Correspondence" columns, Mr. R. Borlase Matthews, referring to the notice issued by the Electricity Commissioners with regard to distributing mains, draws attention to the scandal of repression of demand by electricity supply undertakings, on the ground of inadequate capacity of cables, or worse still, the neglect to lay them. Many instances of this grave dereliction of duty have come to our knowledge from time to time, and the Commissioners' action is doubtless based upon similar information. We read of American undertakings which connect up new consumers almost before the ink is dry on the application forms, but anyone who has become or tried to become a customer of some of our own undertakings knows the difficulties and delays that have to be overcome before the supply is available. Some station managers seem to regard such applications as savouring of impertinence. To such, a period of service with a gas company would afford a wholesome lesson. We are glad to see that the Electricity Commissioners are turning their attention to this end of the chain of electricity supply. Some of the heads of our undertakings are apt to forget that it is their business to *sell electricity*, not merely to make it. As Mr. Matthews remarks, and as we have urged *ad nauseam*, the production of cheap power is of little use unless it is effectively distributed. The market must be cultivated. E.D.A. has done far more than any other organisation to that end, and given adequate support it will do better still.

The Generation of Electricity Statistics.

ON Friday last the Electricity Commissioners issued their fuel consumption returns for the year ending March 31st, 1926, explaining that the delay in their publication had been due to the exceptional pressure of work during the past year. On this occasion the returns have taken a more comprehensive form than formerly, a complete list being given of all the 584 generating stations from which returns were received, with a summary of the technical results of working, except where this was not feasible; 20 stations were shut down, but 20 others came into operation.

Whilst the "group classification" according to output is retained, the main table is in alphabetical order of names, so that it is not easy to effect comparisons, the tables giving the best results in each group having been omitted; the data are provided, but not in order of merit, so that the table of 584 stations has to be scrutinised to pick out interesting records. This appears to us to be regrettable; tables 3, 4, and 5 in previous returns were particularly interesting. Some of the statistics are quoted elsewhere in this issue.

Naturally we turn first to the Barton station of Manchester Corporation, which is to be congratulated on an output of 269 million kWh generated at an average consumption of 1.36 lb., and with a thermal efficiency of 21.51 per cent. This is, we believe, the best record yet established for a British power station, and is worthy to rank with the best in any country. The load factor was 41 per cent.; Stuart Street station, with an output of 104 million kWh, a consumption of 2.14 lb., and a thermal efficiency of 13.92 per cent., was obviously robbed of load for the sake of Barton, its load factor being only 13.2 per cent.—quite sound practice, of course, but a little hard on the older plant.

Next in order of merit is the North Tees station of the Newcastle-on-Tyne Electric Supply Co., Ltd., which had an output of 167 million kWh, and a fuel consumption of 1.51 lb., with a thermal efficiency of 18.75 and a power factor of 47.1 per cent. The Lancashire Electric Power Co.'s Radcliffe station again made an excellent showing: 131 million kWh, 1.67 lb., 17.45 and 31.8 per cent. The average for the five stations each generating over 200 million units per annum was 1.89 lb. of coal per kWh.

The "Electrical Retailer" Supplement.

THE fourth monthly issue of our Supplement prepared for the assistance of the electrical retailing section of the trade accompanies this number of the "ELECTRICAL REVIEW." It contains the usual editorial notes and comments, illustrated articles on "Summer Window Displays," "Some Domestic Electric Fans," a contribution by Mr. E. N. Simons on "Stock-keeping for the Electric Shop," illustrated descriptions of a number of "Selling Lines for Retailers," and a page of trade notes and news. Once again this Supplement will reach all our regular readers and many thousands of electrical traders and contractors of the smaller class, and new business for our manufacturers and traders should result.

Electro-Farming.

The ultra-violet ray treatment of live-stock on a commercial scale; some particulars of the apparatus available for the purpose, and of the results obtained.

By R. BORLASE MATTHEWS, Wh.Ex., A.M.Inst.C.E., M.I.E.E., F.R.Ae.S.

(*Concluded from page* 788.)

3.—*Mercury-Vapour Lamps.*—The working cost of this type is usually less than that of the arc type. The modern patterns consist of short quartz tubes in which the arc is formed. In the case of the atmospheric type (see fig. 2) an orifice, closed by a ground-in quartz stopper, is provided at one end for cleaning purposes. It is started by the heat of a coil fixed on one side of the tube, which vaporises some of the mercury. The running current of the normal atmospheric quartz mercury vapour burner is 2½ to 3 amperes, while the starting current is about 4½ amperes.

Fig. 2.—Kelvin, Bottomley & Baird Atmospheric Mercury-Vapour Lamp.

The vacuum type (fig. 3), although similar in appearance, is naturally totally enclosed; the arc is started by tilting the tube and thus allowing the mercury to connect the two electrodes momentarily; on breaking this contact the arc is formed. Two sets of aluminium cooling fins are usually fixed at the negative (*i.e.*, the bottom) end of the burner.

Both the atmospheric and vacuum types of lamp fall off in efficiency in the course of time. This is due to the formation of a film on the internal surface of the arc tube. In the case of the atmospheric pattern, this film can be washed off with concentrated nitric acid, then rinsing with distilled water and finally with alcohol. The mercury should be filtered before it is replaced. This work is really beyond the limit of skill of most users, so that in the case of either form of lamp, it will have to be returned to the makers. Cleaning is usually required after 500 to 1,000 hours, though sometimes the period may be as long as 2,000 hours.

Results of Experiments.

The experiments conducted on animals have been carried out chiefly to determine the changes which irradiation produces in the blood and the effect of the absorption of lime and phosphorus which the ultra-violet rays cause.

Experiments carried out on pigs have shown that during the period of treatment the amount of calcium and phosphorus which the pigs were able to retain was considerably increased, and an analysis of the bones of the animals showed that those of the irradiated pigs contained a higher phosphorus and calcium content than did those of the control pigs living under exactly similar conditions but not irradiated. These findings are of great importance, for it is known that in the case of young pigs, owing to their very rapid growth, there is always a danger of rickets, as the result of a breakdown of the pig's calcium and phosphorus metabolism. The application is of special importance in the winter time, when little sunlight is available. Experiments carried out on young pigs at the author's farm seem to indicate that the mercury-vapour lamp is not very effective for this purpose. However, the tests are being continued, and it is hoped that more definite information will be available in the course of a few months (fig. 5). The prevention of the loss of calcium and phosphorus from the body has also been found to be of value in the case of lactating animals. For instance, in the case of a heavy milk-yielding cow, there is a tendency to lose more calcium and phosphorus in the first half of the lactation period than she can absorb in her daily ration, so that a supply has to be drawn from the store in her skeleton. This loss often causes a reduction of the milk yield, a loss of breeding capacity and abortion. By irradiating the animals it has been possible to decrease the net loss of calcium at the height of lactation, and in one case the net loss was actually converted into a net gain. One firm of manufacturers is now producing a lamp specially for the treatment of horses and cows.

While the treatment of animals in this way is probably only in the experimental stage, it is claimed that the treatment of poultry (fig. 4) is already of commercial value both in dealing with young chicks and egg production. Young chicks, especially in the early part of the year, are very susceptible to leg weakness, which is closely related to rickets. Results already obtained show that the ultra-violet ray treatment, acting as a supplement to the antirachitic factor of foodstuffs, minimises this tendency. In the case of laying hens, experiments demonstrate that the number of eggs laid during the winter months can be considerably increased by irradiating the birds. An experiment conducted

Fig. 3.—"Hannovia" Suspended Tilting-type Vacuum Mercury-Vapour Lamp.

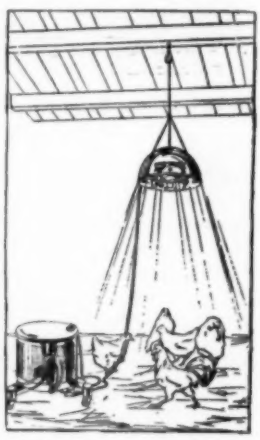


Fig. 4.—"Hannovia" Tilting Lamp in Poultry House.

at the Agricultural University of Wisconsin, U.S.A., was carried out as follows:—

Four groups of hens were confined in coops, out of which natural daylight was shut, artificial light being the only source of illumination. All the birds were treated alike, except that one group was given a daily ten-minute exposure to ultra-violet rays. Tests com-

menced in January and those birds receiving the rays continued to lay abundantly, while the egg production of those not receiving the rays decreased to practically zero. No doubt one of the reasons for this decrease is that laying birds require large quantities of calcium and phosphorus—one egg weighing 56 grammes contains three grammes of calcium—and, as in the case of animals, it is believed that irradiation increases the absorption of calcium and phosphorus from the intestines of the hen. The hatchibility of the egg is also affected. In the case of the irradiated group, the hatchibility was sustained and improved, while that of the eggs from the untreated pens gradually diminished as time went on. Another important fact brought to light was that the quantity of lime in the shell of the eggs, which is an important factor in their value for marketing purposes, was much greater in the eggs of the irradiated hens than in those from the non-irradiated groups.

Interesting results have also been obtained with chickens by using the specially manufactured glass, already referred to, in the windows of the chicken

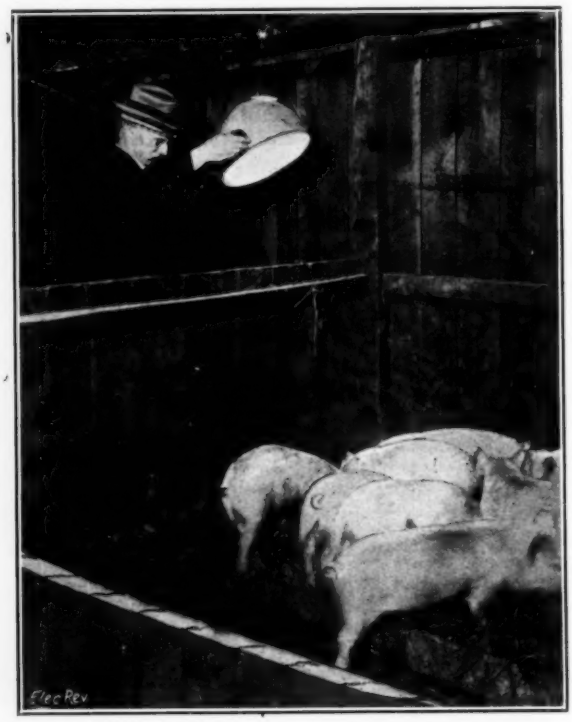


Fig. 15.—Treating Young Pigs with a Quartz Mercury-Vapour Lamp on the writer's Farm at Greater Felcourt.

houses. Chickens reared under this glass have been found to grow more quickly and develop into finer birds than those reared in the ordinary way, although when there is no sunlight about, the artificial lamp must be used. Tests seem to show that black-feathered poultry do not gain much benefit from mercury-vapour lamps; their feathers apparently act as an effective screen.

Dr. Percy Hall, in his book on "Ultra-Violet Rays in the Treatment and Cure of Disease" (Heineman), states "that the absence of sunlight last summer and the preceding winter had more than a little to do with the epidemic of foot-and-mouth disease." By the way, this book deals principally with the use of tungsten arc lamps for treating human beings.

Another interesting book of reference, which deals rather with the use of the mercury-vapour lamp for human beings, is Mackenzie and King's "Practical Violet Light Therapy" (Benn Bros.). Fig. 3 is reproduced from this book, and the writer is indebted to Messrs. Benn Bros. for the loan of the block.

Some recent practical tests in Scotland on well-grown calves did not show any very marked result, though the treated animals certainly did slightly better. One that had ring-worm was cured of it.

So far as the farmer is concerned, the ultra-violet treatment must not be considered as a medical one. It is rather a toning-up of the nervous system, which enables the birds or animals to assimilate their food better and take a more lively interest in life. Mr. J. W. Beauchamp has aptly expressed it as comparable to an aperitif rather than a food.

Foodstuffs.

The effect of treating the food of farm livestock has also been investigated, and it has been found that the animals consuming certain foodstuffs which have been irradiated derive a similar benefit to that which results from the direct treatment of the animal.

Treatment.

There does not seem to be available any convenient practical way of determining the dosage of animals. In the case of human beings the dosage differs with the individual, and it is generally determined by the erythema (or burning) effect on the appearance or pigmentation of the skin. The best plan seems to be to undertreat, so as to be on the safe side, and to adopt, as a rule, ten to fifteen minutes' exposure twice a day at a distance of 3 ft. With a tungsten arc the time should be about ten minutes, and with the impregnated or mercury-vapour lamp, fifteen minutes. The latter time should be more than doubled with an ordinary carbon arc lamp.

The ordinary laws of light must be observed, *i.e.*, the intensity of ultra-violet rays varies inversely as the square of the radius (the law of inverse squares). In other words, if the distance is halved, the intensity of radiation is four times as great. The intensity of radiation is at a maximum along the normal (or perpendicular right-angled) rays. They fall off as the angle of incidence increases. The intensity of inclined rays can be calculated by the "cosine law." As an example, at an angle of sixty degrees the intensity will have fallen to one half that of the "normal" ray. Hence the importance of placing the bird or animal to be treated as close to and in as direct a line as possible with the origin of the radiation. One excellent method of doing this when using arc lamps is to make a hole in the floor, so that the lower part of the mechanism of the lamp sinks below the level of the ground, thus bringing the light on a level with the poultry, pigs, &c. All inflammable matter should be swept away and a wire netting or iron railing guard placed around the lamp.

In the case of milking cows, the writer found that the best results were obtained by placing the lamp on a level with the udder, and directing the rays on to the udder.

The rays between 2,600 and 2,300 Å tend to oxidise some oils and fats, hence a slight smell of burning fat may sometimes be noticed during treatment. Also the waves absorbed by the air produce ozone, which can always be detected when a lamp is in operation by its characteristic smell.

From practical observation, the writer believes that the best months to apply the treatment are November, December, January, February, and March, for at this time of the year the birds and animals suffer through lack of sunshine under the best conditions, while even the small amount of sunshine they do receive usually passes through window glass; further, in winter the sun is so low that the atmosphere cuts off most of the ultra-violet light. The most satisfactory time to apply the treatment is at feeding time, as the animals and birds are together and are not so likely to wander away from the lamp, though in the majority of cases the light seems to attract them.

Protection of the Eyes.

Care should be taken to see that the operator's eyes are protected by goggles from the ultra-violet rays, because,

as these rays are invisible, and no immediate pain is experienced, the harm is done before the operator is aware of the danger. Any ordinary glass (which always contains soda or lead) will serve, but an additional precaution, on account of the strong visible rays, is to use a tinted glass. Fortunately, the eyes of birds and animals, due to their thicker cornea, do not seem to be affected, so the humorous spectacle of a flock of chicks or a herd of cows running around, each fitted complete with goggles, is never likely to be seen.

It is possible that in the near future ultra-violet rays will be used on the farm for many other purposes, such as the purification of water and the sterilisation of milk and butter. This method of treating drinking water has been carried out for some years now. At Amiens, France, about four million gallons of water are sterilised daily in this way, while the French Army has done a great deal of research work in an effort to devise a portable plant of this type for field use.

Practical Results.

In farming operations it takes a very long period of time to establish results, as there are so many variables over which the experimenter has no control. Ultra-violet work is no exception to this rule. However, the treatment of young chicks and young pigs can now be safely recommended. In all probability reliance can also be placed on the treatment of calves and the udders of milch cows. There is more corroboration wanted concerning the treatment of laying hens and fully-grown animals. Also the treatment of foodstuffs is a matter that must still be considered as in the experimental stage.

Examples of ultra-violet lamps intended for the treatment of farm livestock will be demonstrated at the Electro-Farming Exhibit which the writer is arranging on behalf of the Electrical Development Association at the Royal Agricultural Society of England's Show at Newport, Mon., July 5th-8th inclusive.

Mains Engineers' Problems.

A consideration of the methods of, and the advantages to be derived from, duplicating the cables and apparatus used for the supply of electricity to outlying districts.

By D. P. SAYERS, B.Sc.

THE rapid development of electricity supply for domestic heating and cooking of late years, whilst but indirectly felt by generating staffs, has introduced many new difficulties with which the harassed mains engineer has to contend. Not the least of these is the greatly increased difficulty of interrupting the supply to domestic consumers in residential districts. In the past, before the advent of the electric cooker and other electrical domestic appliances, the daytime load in these districts was extremely small. Portions of the l.p. networks could be shut down for an hour or two in the daytime for any special switching or jointing operations without any risk of undue disturbance or public inconvenience. Even where a small industrial load was mixed with the domestic supply, it was generally possible to make the mains dead on Sundays without bringing the mains department into unwelcome notoriety. Now, unfortunately (?—EDS.), those good times have gone for ever; experience shows that a cooking load occurs chiefly during the mornings and in some cases the morning load exceeds the evening lighting peak. Further, of all days in the week, Sunday generally provides the highest cooking peak. Hence, no longer can the mains engineer design a single-line supply to outlying districts and rely on Providence and the quiet of the Sabbath for carrying out any special jointing operations, or odds and ends of routine work, such as cleaning down sub-station switchgear and distribution pillars. The centre and industrial portions of the system have, of course, always been regarded as inviolable in this respect, and have been designed accordingly. The remarks in this article are intended to apply more particularly to outlying suburbs and remote housing estates, of which every undertaking has examples, which are provided with l.p. networks supplied from isolated sub-stations on the h.p. mains.

Generally speaking, it is an economic impossibility to design new distribution networks to the outlying districts in duplicate, or to duplicate the cables and other apparatus of existing networks; such a policy could only result in an enormous amount of idle copper and would give rise to considerable complication in operation. That practice is adopted, necessarily, in areas of heavy industrial load where the revenue is sufficient to justify a certain amount of standby gear; the problem is to provide the same facilities in sparsely populated residential districts.

Dealing first with the l.p. distributors, general practice is almost standardised in the use of multicore cables laid direct in the ground, with service cables of a similar kind. Given these conditions, service connections can be made on the distributor mains without making the cable dead, and "live" jointing is a recognised feature at the low and medium pressures used for distribution. Owing to the extra cost which would be involved, it is not usual to lay sub-distributors along the route of the main distributor. Services are connected direct to the main, and it is therefore not uncommon to find a main distributor anything up to a mile in length, with perhaps sixty or seventy service connections on it. Every joint must be regarded as a possible source of trouble, and a fault occurring on such a main is exceedingly difficult to locate, and the quickest method in the long run being the old-fashioned way of "cut and test." For this purpose it is a great advantage to have permanent disconnecting points at frequent intervals. If there is a main laid along each side of the street, each main can act as a duplicate supply to the other. The ideal arrangement is to lay an interconnecting cable across the street between the corresponding disconnecting points on the two mains. In the event of a fault occurring on either main, only a small number of consumers need be left without a supply whilst repairs are in progress, and only one section of main between two disconnecting points carries more than its normal share of load during this time. In the case of the sub-distributors up side streets, where the ends nearly meet in another road, it pays to extend those extra few yards, if by so doing the distributors can receive an alternative feed in emergency. With regard to the disconnecting points, there appears to be scope for the development of more suitable disconnecting apparatus. Whilst many designs of multi-way link boxes for use in underground pits are avail-

able, they are, for the most part, costly, complicated to install, and when once installed, are not easily altered or added to. The alternative method of fitting the cables with sealing ends and rubber-covered tails which can be connected with screwed or sweated fittings, provides a cheap and flexible job. This arrangement is, however, crude and untidy, and the rubber tails do not give satisfactory service in damp pits. Further, the job of making or breaking heavy currents on two bare cable ends in the cramped conditions of a street manhole does not evoke much enthusiasm in the average workman, especially with the chance of getting a dead short, should tails of opposite polarity be brought together inadvertently.

The question of duplicating sub-stations and high-pressure cables necessarily becomes a matter of greater importance than that of the l.p. networks. In the type of system employing parallel feeders, the principle of duplication is fulfilled immediately; but with the ring-main interconnected type of system, this is not always the case. Economy demands that the load factor of the cables shall be kept as high as possible, and when an extension of the e.h.p. mains is contemplated, it often forms a part only of a scheme which will mature eventually into a ring-main system. This may not be completed for some considerable time, and in the meantime, how is the extension to be safeguarded against breakdowns? A method which is acceptable in many schemes is to make a point of laying a l.p. distributor of a moderate size with the e.h.p. main. This will then become a l.p. interconnector between an existing network and the new distribution point. With the present-day progress, building occurs in the most unexpected places, and it is seldom indeed that such a distributor does not meet the needs of a number of consumers in the course of a few years, and so justify its inclusion in the original scheme. In the meantime it provides an exceedingly useful link for emergency working. It should be remembered that low-pressure mains in a residential district must be designed to keep the voltage-drop within reasonable limits and that the actual loading is much below the ultimate capacity from the point of view of heating. Thus the aforesaid main may well be able to carry the whole of the load of the high-pressure main in an emergency, and even a red glow in the lamps will go some way towards appeasing the consumers' wrath when the e.h.p. main goes down. How many mains engineers to-day, faced with high excavation costs, do not regret the parsimony of their predecessors who failed to lay the low-pressure main with the e.h.p. feeder through the barren wastes which are now budding into respectable suburbs?

Modern e.h.p. switchgear, particularly of the armour-clad type, is fairly immune from serious break-down. Faults have occurred on the older type of sheet-steel cubicle gear, through rain leaking into the sub-station and through faulty alignment, broken porcelains, and so on; on the whole, however, it can be said that this part of the system is not responsible for many breakdowns. On the other hand, modern automatic oil circuit breakers contain so much costly and intricate mechanism that wherever possible they are dispensed with. Duplication is an unwelcome refinement. There are instances of the provision of duplicate busbars being an advantage, and in important switching stations containing more than four or five units, it pays to split the switchboard into two sections with a busbar interconnecting switch. This arrangement allows either half to be shut down for repairs or additions, whilst continuity of supply is maintained on the other half. In the outlying sub-stations, however, everything points to the equipment being kept as simple as possible, ensuring a minimum of initial cost and upkeep. The provision of protective devices is a question on which considerable diversity of opinion exists. That some form of protection for both e.h.p. cables and transformers is essential goes without saying, but the degree is very varied, ranging as it does from simple overload protection with three current transformers to any one of the many developments of the Merz-Price systems with super-sensitive relays, compensated pilot cables, and special tripping batteries. The only rule capable of general application is that the protective gear must be of the most efficient and adequate type near the centre of the system, where shocks occasioned by faults are most heavily felt and the greatest public disturbance caused. The efficiency of the distributing system is greatly improved by a high degree of interconnection, but this can only be carried out safely if the protective gear is absolutely reliable and possesses the two qualities of sensitivity for operation and stability to withstand shock. In the outlying districts both these qualities assume a lesser degree of importance. The vagaries of super-sensitive tripping mechanisms are sufficiently well known to cause the average mains engineer to prefer to fall back upon the old-fashioned plain overload and earth leakage protection, which is at least safe and sure; and the increasing use of the kiosk type of sub-station, in which provision is made for only the most primitive forms of protection, makes this the only practical policy.

The duplication of transformers does not call for a great deal of consideration. This class of plant has now reached a high standard of efficiency and reliability, and the use of two units in place of one involves extra switchgear and entails higher running losses. It is, however, an advantage for an undertaking to keep to as few stock sizes of transformers as possible, and it then pays in large sub-stations to install two standard units in preference to one abnormally large unit, thus providing a measure of duplication and facilitating quick substitution of units.

Thus the problem of what is adequate duplication to ensure continuity of supply faces the engineer at every point between the central station and the consumers' service. In many cases he is handicapped by the lack of standardisation, and this is a point which cannot be stressed too greatly. Standardisation is an essential precedent to inter-connection and duplication; the presence of small networks, relics of earlier days, having non-standard voltages or polarities (frequency hardly comes within the scope of this article), even though they be self-contained, is a hopeless stumbling block to any comprehensive scheme for ensuring continuity of supply. They are pieces which will not fit into the jig-saw puzzle of the distribution system, and every year they go on developing. The only way out is to take the bull by the horns and ruthlessly change over, whether it be d.c. to a.c., 110 to 220 V, or single-phase to three-phase. The cost may be great, but in the matter of duplication, the economic laws are, as usual, at variance with the ideal; and because the benefits of duplication are potential rather than actual, the economic side too often has the last say in the matter. The cause of duplication is well worth fighting for, and to the mains engineer who has fought successfully the benefits become very real indeed when he is faced by a crowd of irate consumers who inform him in no uncertain language that the lights have gone out, the dinner will be spoilt, and the washing cannot be ironed.

A Redeveloped Water-Power Site.

Some particulars are given in *Power* of the 25,000-h.p. hydro-electric installation which has recently been completed at St. Narcisse on the Batiscan River, Canada, 20 miles from Three Rivers, Quebec, by the Shawinigan Water and Power Co. The site was originally developed in 1890 for a capacity of about 1,500 h.p. in three units, operating under a head of 80 ft., the power being transmitted to Three Rivers at 15,000 V by, it is claimed, the first h.p. line in the British Empire. The water is now carried to the new plant, some 4,200 ft. away, where a head of 160 ft. is obtained. The tunnel terminates in a reinforced-concrete surge tank from which two penstocks lead down to the 12,500-h.p. turbines. The generators are supported on concrete pedestals and the operating floor is level with the turbine deck. The project will have an ultimate capacity of 50,000 h.p.

Electricity Supply in Carlisle.

The new 17,000-kW power station of the Carlisle Corporation Electricity Department, which has recently been established at Willow Holme on the River Eden.

PUBLIC electricity supply was first introduced in Carlisle in 1899 as the result of a scheme drawn up in 1897, by Prof. A. B. W. Kennedy, for a generating and distribution system with a power station adjacent to the River Caldew at James Street. The system of supply adopted was three-wire d.c., 460-230 volts, and 500 volts for the tramway undertaking.

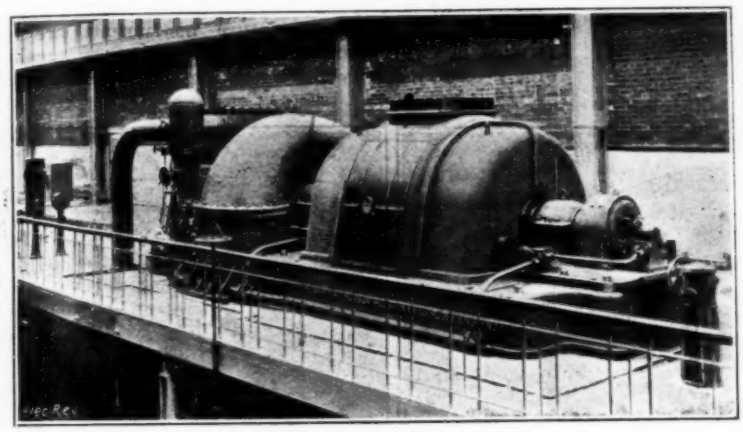


Fig. 1.—6,000-kW Turbo-Alternator.

The original generating plant consisted of two 60- and two 125-kW steam-driven dynamos. Extensions were made to the plant from time to time as the demand increased, up to 1919, when a 2,000-kW turbo-alternator was installed by the British Thomson-Houston Co., Ltd., at a cost of £16,000. This marked the full economic development of the James Street station and led to the building of the new generating works at Willow Holme, which was to be officially inaugurated on Thursday this week. It was in the same year that Mr. C. W. Salt, M.I.E.E., the present city electrical engineer, succeeded Mr. F. W. Purse, M.I.E.E., now engineer and manager at West Ham.

In 1913, a.c. 3-phase was introduced and further development of the old system was restricted. In view of the post-war demand for electricity in and out of the city, Mr. Salt was instructed to report on the situation. A scheme for the new generating station was drawn up by him and referred to the Council's consulting engineer, Mr. Arthur Ellis, who recommended that it should be proceeded with.

During the consideration of these matters the demand increased to an extent that rendered it necessary to install immediately a portion of the new-works plant at James Street. This included a 3,000-kW B.T.-H. turbo-alternator and a 25,000-lb. Stirling boiler.

The Willow Holme station is situated on the River Eden, at a point about 3,000 yards from the centre of the city, where, it is estimated, there is sufficient condensing water for an ultimate plant capacity of 100,000 kW. The general lay-out of the station is on the parallel turbine and boiler-house lines, the turbine room being 201 ft. long by 44 ft. wide, and the boiler house 181 ft. by 72 ft. Between the boiler and turbine houses is an annexe 15 ft. wide for accommodating the main steam headers, steam receivers, booster and feed pumps and other auxiliaries. There is also a 17-ft. annexe which accommodates the switchgear, a battery room, offices, and a repair shop.

The turbine house is designed to accommodate two 6,000-, one 3,000-, and one 2,000-kW turbo-alternators, generating at 3,000 V, 50 cycles, but at present only one new 6,000-kW set, fig. 1, has been installed. The turbine is of the Curtis impulse type, running at 3,000 r.p.m. It was supplied by the British Thomson-Houston Co., Ltd., and is constructed with 10 expansion stages Bleeding branches are provided, and a floating-header steam heater is being installed to work in conjunction with the set. The other machines are to be similarly equipped. The two smaller sets are to be transferred from the James Street works as soon as conditions permit. The turbine room is served by a 45-ton electric travelling crane, by Messrs. A. Jack and Co., Ltd., situated 37 ft. above the basement level,

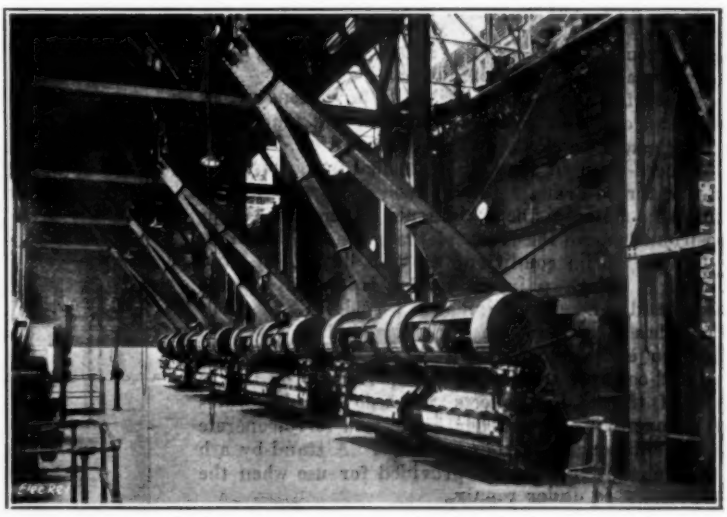


Fig. 2.—Boiler House, Carlisle.

so as to permit the handling of sets up to 20,000-kW capacity. The turbine floor level is 15 ft. 6 in. above the basement.

Ample space being available at the site at a low price, superimposing of the boiler plant has been avoided. The boilers, economisers, main flues, and chimneys are

built up from firing floor level, and a basement extends under the whole plant.

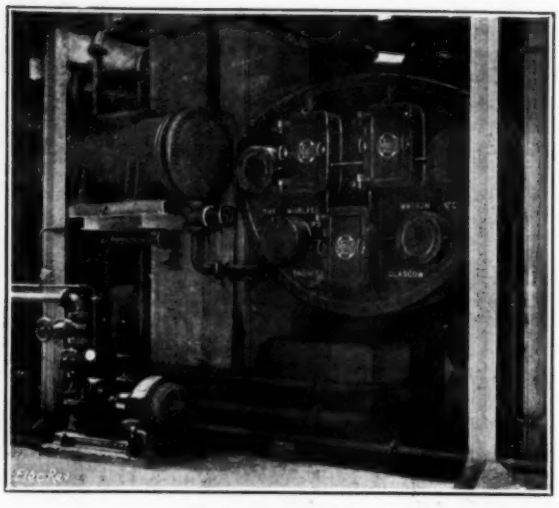


Fig. 3.—Condensing Plant.

With the moderate-sized units installed in the turbine room it was found possible to install boiler plant of sufficient steaming capacity on one side only of the boiler house, leaving the other side available for windows of ample proportions, thus giving good lighting on the stoker fronts and firing floor. Four Stirling boilers, fig. 2, each having an evaporating capacity of 30,000 lb. per hour are at present installed, and one boiler is to be brought from James Street. Provision is also made for the installation of three additional boilers. Two Weir steam turbine feed pumps meet the present needs.

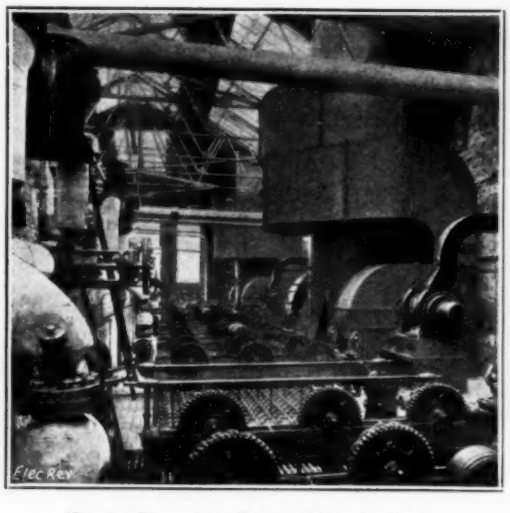


Fig. 4.—Economisers, Fans and Grit Arrestors.

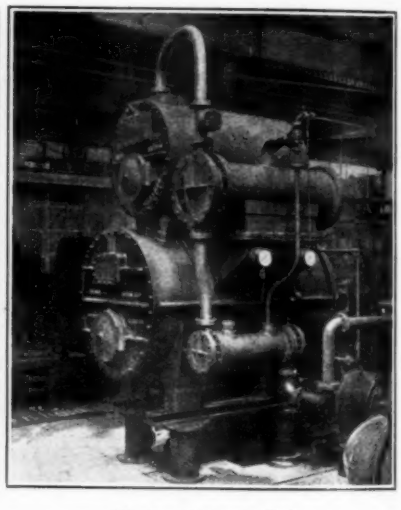


Fig. 5.—De-aerator Unit.

Overhead coal bunkers are provided, and automatic weighing machines check the coal consumption. Forced- and induced-draught fans are controlled from the firing floor, the forced-draught fan in each case being driven by the same motor as the chain-grate stoker; the motor is positioned above the front of the grate, as shown in fig. 2. The steam conditions are 270 lb./sq. in. and 650 deg. F. Each pair of boilers is served by one chimney and a Davidson grit arrestor, fig. 4.

The ashes drop through brick-lined hoppers with their open ends immersed in water contained in a reinforced-concrete trough. A scraper conveyor in the bottom of the trough collects the ashes and elevates them at one end of the boiler house to a ferro-concrete overhead bunker of 30 tons capacity. A stand-by ash elevator of similar design is provided for use when the main elevator is under repair.

Duplicate evaporators for the make-up feed are installed, each capable of dealing with 6,500 lb. of water per hour. They are of the vertical straight-tube pattern, and are equipped with doors just above the floor level to facilitate cleaning. The supply to the evaporators is taken from the river, a storage tank for the crude water being situated on the flat roof. De-aerators, also in duplicate, are installed at the turbine-floor level. Each will deal with 90,000 lb. of water per hour, and is internally lighted and equipped with inspection windows, fig. 5. The evaporators receive the exhaust steam from the boiler feed pumps direct; it is then passed into the de-aerators, where it is condensed by direct contact with the feed water before entering the degassing chambers. Covered feed-water surge tanks supported on rolled-steel joists above the de-aerators are steam sealed. Normally the whole of the water to the boiler feed pumps will pass through the de-aerators, but the system permits of either set being shut off for cleaning and also of the complete by-passing of the equipment. Modern oxygen-content instruments are provided.

The control room is on the upper floor of the switchgear annexe and generally provides for the remote control of the whole works. The main switchgear is of B.T.-H. manufacture and electrically and remotely controlled. It consists of stone cells fitted with steel doors, fig. 6, and is situated on the ground floor. A special interlock system is provided. A system of telegraphs and loud-speaking telephones allows communication between the control room and the turbine and boiler rooms. Remote indicating and recording CO_2 and temperature instruments are installed in the control room. A 230-V battery supplies the necessary energy for operating the switchgear and

Fig. 6.—E.H.P. Switch Cubicles.

protective equipment, and provides for emergency lighting in the station.

The condensing plant for the 6,000-kW set, fig. 3, which, with the evaporators and de-aerators, was supplied by Messrs. Mirrlees, Watson & Co., Ltd., will deal with 65,000 lb. of steam per hour, and is designed to give a vacuum of 29.1 in. with 9,500 gallons of water per minute at 55 deg. F. Duplicate condensate pumps are

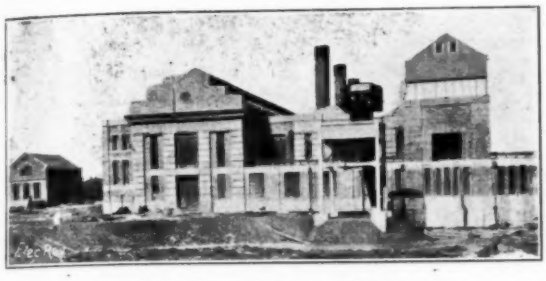


Fig. 7.—External View of Station.

installed, each capable of dealing with the full quantity of the condensate and driven by a 13-h.p. motor. A main supply header receives the circulating water from all the pumps. While the system is designed for siphonic assistance, the pumps will give sufficient head to prevent a shut down. Two circulating pumps are at present installed, each having a capacity of 588,000 gal. per hour. Their centre lines are 2 ft. below the level of the river bed, to ensure an immediate flow on starting, and they are driven by 120-h.p. vertical-spindle motors installed above the maximum recorded flood level of the river. The pump room has been erected immediately on the river bank. Two vertical-spindle service pumps, 27,000 gal. per hour, are also installed to provide a water supply for screen washing, the evaporators, and cooling bearings. The water is taken through two travelling, self-cleaning band screens, having a total effective screening height of 32 ft. because of the high flood level of the river. The pump-house equipment is remotely controlled from the power station. A L.M. & S. Railway siding, which terminates in the turbine room, allows coal to be brought direct to the works, a fireless steam-storage locomotive being used for this purpose. The coal is emptied into a 20-ton receiving hopper, and an endless chain of buckets elevates and distributes it to the overhead bunkers.

The transmission system consists generally of 24 main cables run from the power house, fig. 7, to various points in the city, including the James Street generating station, through earthenware ducts, protected from the road traffic by reinforced concrete where necessary. With the exception of the densely-populated area in the centre of the city, of about 1,000 yards radius, the system of distribution is 3-phase, 4-wire. The centre area is still d.c. and is supplied from rotaries at James Street, where the old generating station will be retained as a convertor sub-station.

An interesting development, which has only just been completed, is a supply to the Carlisle Plaster and Cement Works at Cocklakes, about seven miles south of Carlisle. The transmission is at 11,000 V by means of a simple overhead line. At the receiving sub-station the pressure is stepped down direct to 420 V by means of two 600-kVA J. & P. transformers, the e.h.p. supply being dealt with by a 2-panel, truck-type switchboard by Messrs. Ferguson, Pailin, Ltd., fig. 9. Provision is made in this sub-station for further extensions. Fig. 8 shows the h.p. pillar-type drawout switchgear (F.P.) which is being adopted in most of the sub-stations on the 3,000-V system. It is interesting to note that the same type of switchgear is being used on the l.p. side.

Considerable advance has been made by the under-

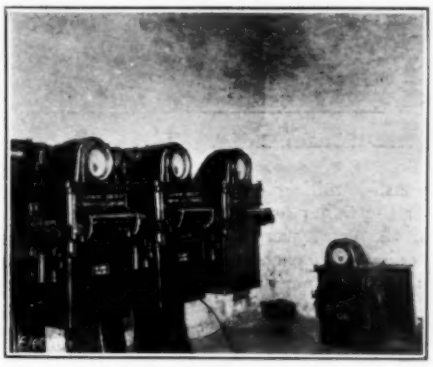


Fig. 8.—Standard Sub-station Switchgear.

Fig. 9.—11,000-V Switchgear.

taking in the development of the domestic load, and an all-in domestic rate of ¾d. per kWh, plus a fixed ratable-value charge, has been established.

The Incorporated Municipal Electrical Association.—I.

Annual Convention at Buxton.

ON Tuesday next the 1927 Convention of the I.M.E.A. will be opened at the Opera House, Buxton, with a civic welcome by the Mayor, Councillor W. Goodwin, J.P., and the presidential address of Mr. R. W. L. Phillips, M.I.E.E., engineer and manager of the Bedford Electricity Department. In our issue of July 9th, 1926, we gave a portrait of Mr. Phillips, and a sketch of his career, and though the Convention will not visit Bedford, a few particulars of the undertaking which he has conducted with notable success for 26 years will be of interest.

When he resigned the post of deputy chief engineer at Bristol in 1901 to take charge of the Bedford undertaking, the latter was labouring under a cloud of annual deficits, but Mr. Phillips soon brought it into the sunshine of prosperity, by adopting a progressive policy, cultivating a day load, and embarking upon the electrification of the surrounding rural areas.

The generating station is situated on the River Ouse. Sidings of the L.M. & S. Railway are near at hand, and from these coal is transported by road to the works. Modern coal-handling plant is installed; belt and worm conveyors serve overhead bunkers from which eight boilers, with a total evaporating capacity of

170,000 lb. per hour are fed. One boiler, which was converted to oil-firing during the coal strike, still retains the liquid-fuel feature, and is used as a convenient peak-load plant. Two recently installed 40,000 lb. Stirling boilers are equipped with Davidson grit arrestors. It has been found advisable to separate the coal, using the nuts for the old plant and the fines for the new, and for this purpose a rotary screen is employed in conjunction with the coal conveyors.

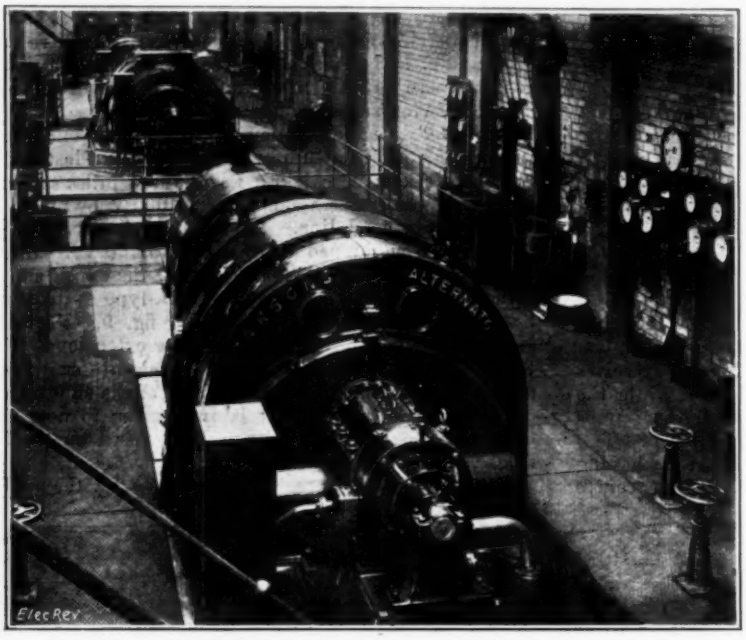


Fig. 1.—New Turbo-Alternators, Bedford.

An interesting feature is the ash-handling equipment. Two water reservoirs under the boiler house are fed with the cooling water from the condensers, and by means of tilting weirs, one at one end of each reservoir, the water is automatically and periodically emptied into troughs into which the ashes from the grates are dropped. The flow carries the ashes into a system of sumps, where they are screened, and the water is returned to the river. The ashes are cleaned in the process, with the result that sufficient revenue is obtained to cover the expenses incurred in removing the residue from the sumps, for which purpose an electric crane and grab are used.

As recently as last year the system of generation at Bedford was changed from single-phase, 60 cycles, to 3-phase, 50 cycles. The first step in connection with this scheme was to install two new 6,600-V, 3-phase, 3,750-kW turbo-alternators, fig. 1, one by Messrs. C. A. Parsons & Co., Ltd., and one by Messrs. W. H. Allen, Sons & Co., Ltd. It was possible to put the whole load of the station on these machines, while two existing 1,500-kW single-phase machines, one Parsons and one B.T.-H., were rewound for 3-phase working. The four machines mentioned now constitute the whole of the active generating plant.

The urban area network is divided into two main sections, and these are supplied at 2,000 V, single-phase, from the two phases of Scott-connected transformer banks, which are fed at the generated pressure.

The authorised supply area of the undertaking now covers about 200 sq. miles, over which a great many tiny villages or hamlets are scattered. To some eleven of these the supply has already been extended, mostly by means of underground cables. In some cases, where further extensions are anticipated, or where ring-main systems to connect up with existing single-phase systems are contemplated, the 3-phase, 6,600-V supply is run out to suitable kiosk sub-stations and there converted to 2-phase, 2,000-V by means of Scott-connected transformer banks for single-phase distribution, or the pressure is reduced directly to that of the l.p. supply system, 365 V, 3-phase. Fig. 2 shows the type of kiosk employed; it is actually a special sub-station for supplying Sandy and district, about ten miles east of Bedford. It houses three 500-kVA transformers forming a 3-phase, step-up bank from 6,600 to 11,000 V for linking up with the mains of the Bedfordshire, Cambridgeshire and Huntingdonshire Electric Supply Co.

Touring the area, one sees small kiosks, approximately 3 ft. square by 6 ft. high, dotted about the countryside in all manner of places. These supply isolated houses or groups of houses at 210 V, single-phase, and are fed from the h.p. 2,000-V single-phase mains. The kiosks were all supplied by the Yorkshire Switchgear Co., Ltd.

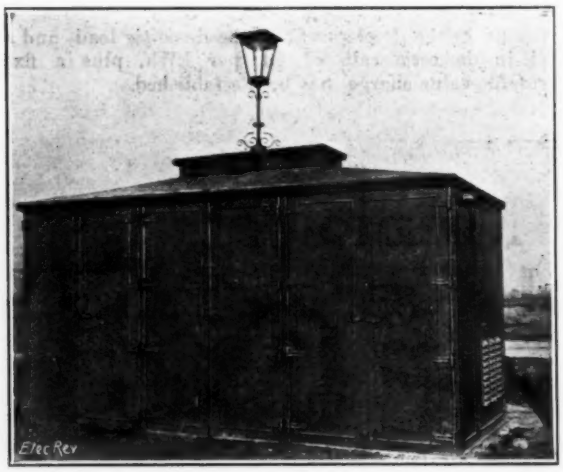


Fig. 2.—Rural Supply Sub-station.

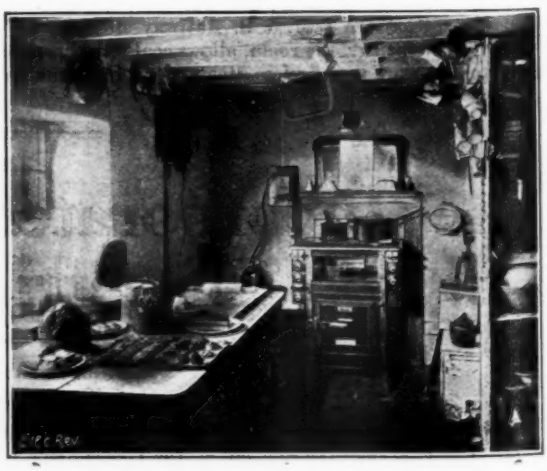


Fig. 3.—Electric Cooker in Country Kitchen.

It is encouraging to note that about 1,000 consumers in the rural areas have so far been connected up, out of a population of about 41,000. Somewhere about 70 miles of h.p. and l.p. cable have been laid in this connection.

While it has been in all cases a difficult problem to

cut the capital expenditure to the necessary fine limits to render the estimated limited revenue from the scheme remunerative, it has invariably been the case that the supply has resulted in increased building activities in the districts.

Fig. 4.—Buxton, Bird's-Eye View.

The country folk are very pleased with the supply, both for lighting and cooking, and take a keen interest in the modern methods and apparatus introduced. Fig. 3 shows a modern cooker in an old-fashioned country kitchen. The housewife of this establishment described the cooker as "wonderful," and said that her bill of 12s. 6d. for five weeks' consumption was considerably less than the figure for coal would have been. The tariffs for lighting and heating vary from 6½d. to 9d. and 2¼d. to 3d. respectively, according to the "zone" or distance from the generating station.

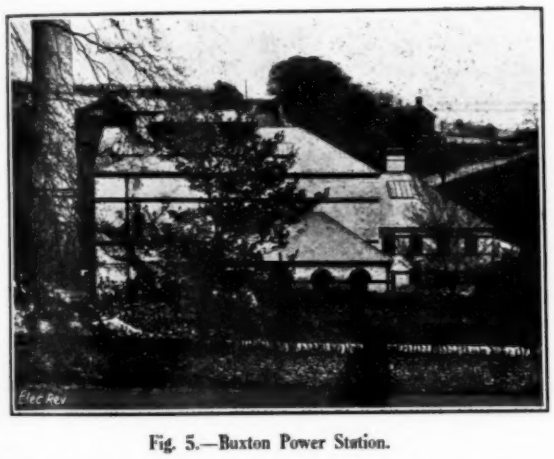


Fig. 5.—Buxton Power Station.

The maximum load on the station to date is 5,350 kW, and the energy generated during the year ended March 31st, 1927, was 15 million kWh. About 7,400 consumers are connected to the mains.

It will be seen that under the President's guidance the undertaking has steadily developed, and has successfully extended its operations far into the rural areas, thus again refuting the arguments of those who still maintain that such areas cannot be dealt with on an economically sound basis.

Apart from the routine business which is so efficiently handled by the Council of the I.M.E.A., Mr. Phillips's year of office, now drawing to a close, has been marked by the termination of the long conflict between the Association and the electrical contractors. Whatever good may eventually come from the main provisions of the Act of 1926, it can hardly be questioned that the one which will bear fruit most quickly and most effectively is the clause that was inserted at the last minute, embodying the agreement between the municipal undertakings and the contractors; and Mr. Phillips is to be congratulated on his share of the work which had so happy a conclusion.

In later issues we shall report the proceedings of the Convention, which this year will be less strenuous than on some previous occasions. A more delightful spot for a convention than "Beautiful Buxton" could hardly be imagined; unlike some watering places of comparatively mushroom growth, it traces its history as a health resort from Roman times, and has frequently entertained distinguished visitors, including Royal guests.

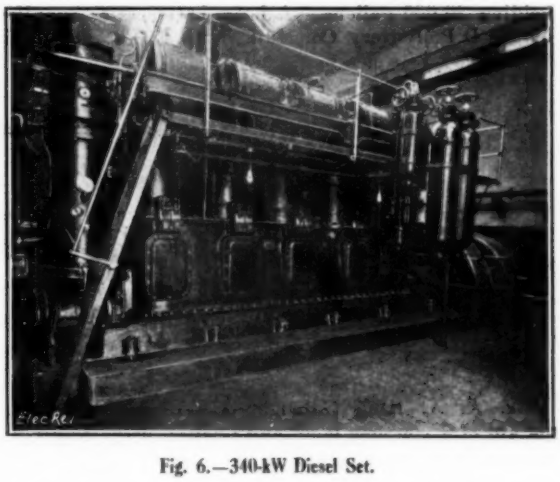


Fig. 6.—340-kW Diesel Set.

Buxton, fig. 4, is the highest town in the Kingdom, being situated 1,000 ft. above sea level, where the air is dry and bracing and fogs are rarely met with. It is noted

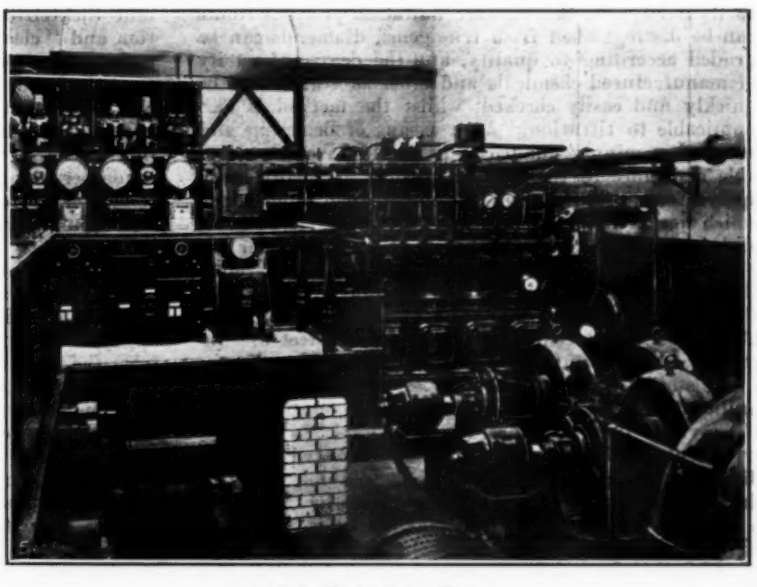


Fig. 7.—Engine Room, Buxton.

for its healing springs, nine in number, which yield a flow of half a million gallons a day at a temperature of 82 deg. F. The water is highly radio-active, and contains a variety of salts, besides an exceptional amount of nitrogen and other gases; abundant provision for its use, both internal and external, is made at St. Ann's Well and the "Natural" and "Thermal" Baths. The town offers other attractions to the visitor in the shape of charming gardens, provision for games, its Pavilion and Opera House, and other means of entertainment, and is itself a pleasant place provided with innumerable hotels; but it is also a centre from which an endless variety of excursions to places of interest and beauty can be made, being situated in the heart of the Peak District, amongst hills and dales that rival those of the Lake District.

The electricity undertaking is owned by the Corporation, and was inaugurated in 1900, giving a d.c. supply at 230/460 volts. The original plant was steam-driven, but the present borough electrical engineer, Mr. A. Bishop, in 1919, introduced a 100-kW E.C.C. dynamo driven by a four-cylinder Browett-Lindley gas engine, the success of which led the Council to sanction the replacement of all the steam plant with gas plant, and in 1920 a scheme was drawn up which, after the late Mr. C. H. Wordingham had been consulted, was adopted practically without modification. Two 200-kW Browett-E.C.C. sets were installed, and by the end of 1923 a profit of £3,500 was realised. Cooling water was provided by a cooling tower and a concrete tank holding 20,000 gallons. A large battery was supplied by the D.P. Battery Co., Ltd., with E.C.C. automatic reversible boosters and Tirrill regulators, by which means the running load factor was kept up to 90 per cent. Extensions proved necessary in 1924, and a four-cylinder Diesel engine by Messrs. Mirrlees, Bickerton and Day, Ltd., was installed, driving an E.C.C. 233-kW dynamo, with which the fuel cost was reduced from 0.94d. per kWh generated with gas at 2s. per 1,000 cu. ft. to 0.37d. with oil at 107s. 6d. per ton, the total working cost in 1925-6 amounting to 0.522d. The Diesel set ran for 4,065 hours, and generated two-thirds of the output, with an average consumption of 0.629 lb. per kWh, the lowest recorded for 37 British stations. In November last year a five-cylinder 340-kW set of the same make was installed, fig. 6, bringing the plant capacity up to 1,150 kW. Figs. 5 and 7 show respectively exterior and interior views of the station.

The total output (sold) in 1925-6 was 843,500 kWh; of this amount 240,160 kWh was used for power and heating, including 111,570 kWh for domestic purposes. There is no industrial power load in Buxton, which is becoming more and more a residential district for Manchester and other large towns. The power station is situated on the River Wye, about a mile from the centre of the town; Callender cables are used. The rates charged for lighting range from 6½d. to 5d., and for power and heating from 2d. to 1d.; a two-part domestic tariff is in contemplation. The capital outlay amounts to £104,800, of which £61,753 has been redeemed. There was a gross surplus last year of £7,949, and a net surplus of £2,086.

The Royal Society's Soirée.

Annual Exhibition and Demonstrations.

(*Concluded from page* 792.)

Mr. A. A. King (Albright & Wilson, Ltd.), with the aid of a mercury lamp and Chance filter, strikingly demonstrated the application of ultra-violet radiation to the detection of impurities in various substances. For instance, distilled water, including grades hitherto assumed to be free from foreign matter, when exposed to ultra-violet light fluoresces more or less according to its purity; in this manner imitation precious stones can be distinguished from true gems, diamonds can be graded according to quality, and the degree of purity of manufactured chemicals and other substances can be quickly and easily checked, whilst the method is also applicable to titration. As a means of detecting and estimating minute quantities it should be of considerable assistance to the chemist, besides its many other spheres of usefulness. For example, when filter paper which has been sensitised with pure mercuric chloride and prepared by the Gutzeit method for testing for the presence of arsenic is examined in ultra-violet light, the unchanged mercuric chloride fluoresces blue, whilst the yellow mercury-arsenic stain on it stands out as a black disk; this contrast is utilised to detect arsenic stains which are quite invisible to the eye in ordinary light, and a quantity of arsenic as minute as 0.00001 milligram may thus be estimated quantitatively. Ultra-violet light is, of course, also used for medical treatment of diseases, and Mr. King indicated how the difficulty of application to such inaccessible areas as the back of the nose, &c., can be overcome by the use of a suitably-shaped applicator: the latter is a quartz rod, curved or bent as required, into the straight end of which the ultra-violet light is directed, following the curve by reflection inside the rod, and emerging from the other end as a beam which impinges on the desired area which is being subjected to treatment.

The research laboratories of the General Electric Co., Ltd., had three exhibits illustrative of: (i) A method of measuring the vacuum in an electric lamp (Mr. J. T. Randall), due to Dr. P. Selényi, of the Forschungslaboratorium Tungsram des Vereinigten Glühlampen und Elektrizitäts A.G., Ujpest. Between the evacuation and "clean-up" processes the residual gas in the lamp is absorbed by the walls of the bulb under certain conditions, usually coincident with an electric discharge which takes place across the space between the two filament electrodes. Selényi's method of observing this discharge is to turn the lamp into a system of condensers by partially immersing it in water: one condenser is formed by the filament system and the inner bulb surface, the other by the inner and outer bulb surfaces. If an oscillating potential is applied between the water and one end of the lamp filament, a note characteristic of the capacity of the lamp condenser can be heard in a pair of telephones inserted at an appropriate point; the oscillating potential is supplied from the two terminals of a "flickering" neon lamp. If an adjustable voltage is now applied to the lamp filament and its value gradually raised, a point is reached when ionisation of the residual gas in the lamp sets in; the gas is now conducting and, therefore, forms a non-ohmic shunt across the condenser formed by the filament system and inner bulb surface; hence the effective capacity of the lamp condenser is changed and the note in the telephones decreases in pitch. As soon as absorption of the gas starts, the number of ions

decreases again and the note in the telephones rises in pitch; when the "clean-up" is completed, the note in the telephones remains at a constant pitch.

(ii) New methods of using photoelectric cells (Mr. N. R. Campbell). Hitherto gasfilled cells have always been used at voltages less than that required to pass a spark discharge; but if higher voltages are used, the discharge being stabilised by a thermionic current-limiter in series with the cell, the current through the cell is intermittent and the frequency of intermittence varies with the light incident on the cell; changes of this frequency are used to detect or measure light. Two methods depending on the principle just stated are: (*a*) the current through the cell is adjusted by means of the current-limiter so that the frequency of intermittence in the dark is about 5,000 per second; very moderate illumination will then cause the oscillations to cease. This method is thought to have applications in the transmission of pictures by radio-telegraphy, for in order to modulate waves of radio-frequency by light signals it is desirable to have those signals in the form of oscillations of about 5,000 per second frequency. In present methods some subsidiary device has to be introduced to convert the signals into this form, but by the new method the signals of the necessary form are produced by the cell itself and, moreover, there is probably some gain of sensitivity, and weaker light can be used. (*b*) The current is adjusted so that the frequency of intermittence is about 1 per second; very feeble illumination will then produce a change of frequency; the illumination can be measured by counting the rate of the clicks heard in a telephone in series with the cell. By this means it is possible to detect and measure, with extremely simple apparatus involving no delicate parts, illumination which otherwise would require a sensitive electrometer, constant batteries, perfect insulation, and other elaborations. It is thought that the method may have applications in astronomy, for the necessity of mounting the apparatus on a telescope makes it desirable to avoid so far as is possible all instrumental elaboration.

(iii) Thermionic emission from absorbed layers of barium on tungsten (J. W. Ryde and A. C. Bartlett). A spiral, which can be heated electrically, is coated with barium azide (BaN_6) which is decomposed, forming barium metal. The spiral surrounds a tungsten filament mounted axially; on heating the spiral, which acts as the anode, the barium slowly evaporates and forms a monatomic layer on the surface of the filament, which is run at a temperature of about 1,200 deg. K. If the supply of barium is relatively small, the emission gradually increases to an equilibrium value and then, if the supply is stopped, it slowly decays. If, however, the experiment is repeated with the spiral at a higher temperature, so that the supply of barium is increased, the emission rises to a maximum and then falls to a much lower equilibrium value. On stopping the supply, the emission current rises to another maximum, after which it slowly decays as the barium evaporates. If the relative rates of supply and evaporation are raised by changing the temperatures of the filament and spiral, either or both of the two maxima may be made to occur. This phenomenon appears to be due to the formation of a second monatomic layer on top of the first, the thermionic emission being due only to the uncovered parts of the first layer of barium. The nature of the second layer has not yet been settled, but it may be nitrogen. On the above assumption it may be shown theoretically that the first maximum will only occur if the supply of barium atoms is greater than the evaporation of those forming the second layer; also the second maximum will only occur if the supply of the atoms forming the second layer is greater than the evaporation of those in the first; this is borne out by experiment. The relation between the thermionic emission and the fraction of the filament surface covered by exposed barium atoms is being studied by these means. The method is also being applied to the study of the formation and evaporation of monatomic layers of barium.

Legal.

Workmen's Compensation Case.

AT the Birmingham County Court recently Callender's Cable and Construction Co., Ltd., asked for a revision of the weekly award of £1 3s. 11d. compensation paid to Richard Brinsden, a labourer, who injured his back while lifting heavy slabs of stone on April 26th, 1926. The contention of the firm was that Brinsden was able to do light work. Two consulting surgeons stated that there was nothing to interfere with the man's working capacity, but his panel doctor stated that Brinsden walked in a peculiar and strained position. Judge Dobb took the view, having regard to the contradictory nature of the medical evidence, that the man's working capacity was so limited as to amount to total incapacity. It had been pointed out, on behalf of the employers, that Brinsden deliberately held himself in a strained position, but a man without any medical knowledge could not have adopted the well-recognised posture for abnormal curvature. He therefore gave judgment for the respondent.

Theft of Electricity.

AT the Hendon Petty Sessions recently George Cohen, Golders Green, was summoned at the instance of the Hendon Electric Supply Co., Ltd., for the fraudulent abstraction of electricity from its mains and preventing a meter registering. It was stated for the prosecution that the defendant carried on business as "The Reliance Electric & Maintenance Co." One of the company's inspectors, on visiting the defendant's premises in February found that a number of lamps were connected by means of a heating plug, electricity thus being obtained at a lower rate than the correct one for lighting. Defendant, who pleaded "Not guilty," maintained that he had been overcharged for electricity on account of a defective meter, and it was admitted that when his meter was tested it was found to be over-registering to the extent of 5½ per cent. He also stated that the connection to the wrong meter was made by mistake by a boy. The mistake was made in the daytime and no current was used. The Bench imposed a fine of £2 for each offence and £3 3s. costs. The defendant said that he would appeal from the decision.

Action Against the Stepney Council.

IT is reported that the action being brought by Messrs. Scammell & Nephew, a Spitalfields firm, against members of the Stepney Borough Council will probably be heard before the Long Vacation. The action is in the nature of a test of the legality of the Council's action in cutting off the supply of electricity to certain premises during last year's general strike. Sir John Simon, K.C., is said to have been briefed by the plaintiffs.

Electricity Finance and Distribution Corporation, Ltd.

IN the Companies Winding Up Court on May 17th, Mr. Justice Eve made an order for the compulsory winding up of this company.

Impex Electrical, Ltd., v. Norton Wireless Co., Ltd.

MR. JUSTICE TOMLIN, in the Chancery Division on May 18th, concluded the hearing of this action for an injunction restraining the infringement of the plaintiffs' trade-mark "Dario" for wireless valves.

Mr. DAVID CARTWRIGHT, recalled after giving evidence the previous week (*vide* our last issue, p. 823), said he could not identify a man in court as the chauffeur whom he saw buying a valve in the defendants' shop. A man named Scott who went with Hill, but waited outside the shop, said he examined the valve he bought and found that it bore the trade mark "Dario."

Giving judgment, his LORDSHIP said that the evidence of Hill and Scott had convinced him that there was no confusion of valves as had been suggested, and having regard to the evidence of Mr. Kelly, which was unsatisfactory to a high degree, and to the evidence from Imperial Airways, Ltd., and the documents, it was clear to him that in the summer of 1926 the defendants were importing and selling French valves bearing the mark "Dario." He granted the injunction asked for with costs, and said there would be an inquiry as to damages.

Esders v. Porn.

IN the Mayor's and City of London Court, before Mr. Registrar Dell, on May 20th, Mr. C. F. G. Esders sued Mr. Marcel Porn for £8 7s. 6d., balance of commission said to be due on account of the sale of electric lifts. The plaintiff stated that the basis of his engagement was that he should receive 5 per cent. and 2½ per cent. on all orders obtained by him. Later the defendant paid him £1 a week salary, which was to go towards his expenses. The defendant maintained that that £1 per week was an advance in respect of commission. The Registrar held that that was so, and gave judgment for the defendant with costs.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The Department of Overseas Trade.

The British Engineers' Association has passed a resolution to the effect that, while it realises the urgent need for State economy, it shares in the widespread doubt and anxiety as to the effects of the termination of the separate existence of the Department of Overseas Trade. The resolution emphasises the vital importance of overseas trade to this country, and says that many of the services rendered by the Department are indispensable.

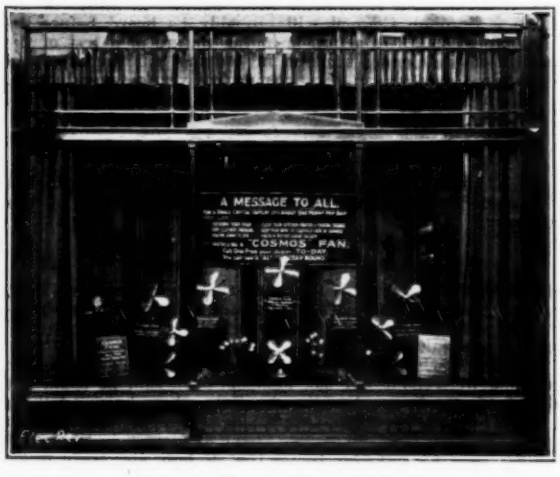
A deputation on the subject from the Association of Chambers of Commerce was received by the President of the Board of Trade on Monday last, when Sir P. Cunliffe-Lister promised to report the views expressed to the Government.

A G.E.C. Fan Campaign.

The General Electric Co., Ltd., is making a special effort to increase the sale of fans now that the summer season is imminent. While a good deal of national advertising is being done, the aid of dealers is also being enlisted, as the company recognises that manufacturers alone cannot achieve the desired results. To this end the company has produced special window display devices and attractive folders for the use of retailers. To further the sales of fans by demonstration (the best way), an extra discount is offered to dealers upon the first fan purchased.

A "Cosmos" Fan Display.

A seasonable display has been arranged by Metro-Vick Supplies, Ltd., in one of the windows of its Charing Cross



A "Cosmos" Fan Display.

Road premises. It consists of a simple arrangement of "Cosmos" fans, each of which bears a card announcing the virtues of the appliance. A large message in the centre of the window indicates the scope of the electric fan's activities.

Rugby and Cable Tenders.

The *Birmingham Post* reports that at last week's meeting the Rugby Urban District Council considered a recommendation from the Electricity Committee that the lowest British tender received for an electric cable should be accepted. A Liberal member of the Council moved the substitution of "the most suitable tender," in the place of "the lowest British tender." He objected to be tied down to the acceptance of British goods, and said that when the Council, some time ago, had accepted a Swiss tender it subsequently received "dirty treatment" from British firms. The amendment was not seconded, but Mr. H. Yates (chairman of the Committee) said that there was a cartel among cable suppliers, and there was very little difference between the tenders sent in by British manufacturers. "The same people tendered every time, and it was always the same firm which was the lowest, giving the impression that each firm had its own field of operation."

Receiver Appointed.

The Electrical Devices, Ltd., Newcastle-on-Tyne.—Mr. Sadler Forster, of County Chambers, Marton Road, Middlesbrough, has been appointed receiver and manager on behalf of the debenture holders as from May 19th.

Local Exhibitions.

Richmond (Yorks.).—Under the auspices of the Electricity Committee, an electrical exhibition was held on May 17th and 18th in the Town Hall, Richmond. A number of leading manufacturers participated, including the Metropolitan-Vickers Electrical Co., Ltd., the Edison Swan Electric Co., Ltd., and the General Electric Co., Ltd. There were also several local exhibitors, including Messrs. Wm. Sykes and Co., Spence & Co., A. Morton, R. Kirtley, L. Paxton, and W. Husband. Mr. A. Brand, chairman of the Electricity Committee, at the opening ceremony, said that, although the matter had been discussed for 20 years, electricity supply only became available in October last. At first there were 140 consumers, and 50 had since been added, and applications were being received daily. It was hoped that the exhibition would increase the demand and permit of a decrease in the charges.

Hammersmith.—During a recent "Health Week Campaign" at Hammersmith the Borough Electricity Department, in conjunction with the General Electric Co., Ltd., arranged a stand at the Town Hall. Upon this appeared a good display of "Magnet" electrical appliances for the home. A view of the stand is reproduced herewith.

An Electrical Display at Hammersmith.

Cheadle and Gatley.—The municipal Electricity Department (engineer: Mr. R. W. Willis) has adopted a cooker hiring scheme, and in support of this is arranging exhibitions and demonstrations in the three parts of its area, Cheadle, Gatley, and Cheadle Hulme, during June and July.

Threatened A.E.G. Strike.

The Berlin correspondent of the *Daily Telegraph* reported last week that differences between the directors and employés of the Allgemeine Elektrizitäts Gesellschaft seemed to portend a serious conflict. The trouble is due to the reduction of toolmakers' wages, coupled with a rise in the cost of living. The directors refused to meet the men, and the latter then demanded a 15 per cent. increase in wages. They were offered an increase of three pfennigs per hour but, declining this, left work. It was expected that the dispute would extend to other departments, eventually involving 50,000 workers, and perhaps to other undertakings. It is being maintained that the industrial "rationalisation" schemes are being carried out at the expense of the employés. It was reported later that a settlement had been reached, part of the demand being granted.

New Earthenware Pipe Works.

Messrs. DOULTON & Co., LTD., are establishing on a 25-acre site at Erith a new works for the production of earthenware pipes. The new works is exceptionally well situated for export, having a private Thames-side jetty and railway siding. The factory is equipped throughout with modern labour-saving plant for handling raw materials and finished products, and the whole of the manufacturing machinery will be driven by electricity produced at the company's own power house adjoining the factory.

Employment during April.

The May *Ministry of Labour Gazette* says that employment in the engineering industry during April was slack on the whole, although there was a further improvement in all sections. In the motor vehicle and electrical sections it was fairly good. The overall proportion of unemployed in the industry fell from 10.3 to 9.7 per cent., and in the electrical engineering branch the figure declined from 6.2 to 5.6 per cent. The other electrical industries also improved. The proportion of unemployed in the electric cable, wire and lamp manufacturing group fell from 8.6 to 7.7 per cent., and that of the electrical wiring and contracting industry from 7.9 to 7.4 per cent. The actual numbers of unemployed were as follows:—Engineering, 96,798; electrical engineering, 4,333; electric cable, wire and lamp manufacture, 6,790; and electrical wiring and contracting, 1,031.

Recent Contracts.

Among the orders recently received by members of the British Engineers' Association are the following:—A mechanical loading, handling and storage plant, for the British Phosphate Commissioners, for dealing with the huge deposits of phosphate of lime on Nauru and Ocean Islands in the South Pacific, which were taken over from Germany during the war. The plant will be electrically driven. Messrs. Marryat & Place, Ltd., have supplied eight two-head rivet heaters to Messrs. Cammell, Laird & Co., Ltd. A contract for an electrically-driven aerial ropeway ten miles long has been received from India by the British Ropeway Engineering Co., Ltd. The order for the hydro-electric plant for this work has also been placed in this country. Messrs. J. Blakeborough & Sons, Ltd., in addition to supplying the turbines for the Waikaremoana (N.Z.) hydro-electric undertaking, have also received an order for the necessary valve equipment. The same company is also supplying the water-controlling equipment for the 126,000-h.p. development at Komaki of the Nippon Electric Power Co. The Harland Engineering Co., Ltd., is providing six motor-driven high-pressure boiler-feed pumps (about 250 h.p. each) for the Bunnerong power station erected by the Sydney (N.S.W.) Municipal Council. Pumps, water-screening plant, circulating mains and pipework are being supplied by the Mirrlees, Watson Co., Ltd., for the Indian State Railways' power station at Kalyan.

Electric Power in Industry.

Continuing its series of Preliminary Reports on the Census of Production, 1924, the *Board of Trade Journal* for May 19th contains particulars of further industries. It is shown that in the typefounding, electrotyping, engraving, process block making and die-sinking trades in 1924 there was only 65 kW of generating plant (as compared with 33 kW in 1907). The electric motors in use had an aggregate capacity of 2,952 h.p., power for 2,877 h.p. of which was purchased. The billiard table and sports requisites trades reported 450 kW of generating plant (against 239 kW in 1912) and 3,974 h.p. of electric motors (power for 3,144 h.p. purchased). The games and toys trades had 239 kW of generating plant and 1,571 h.p. of motors (power purchased for 1,363 h.p.). Generating plant of 2,062 kW was reported by the engine and boiler packing and asbestos trades (against 1,030 kW in 1912); there were 9,350 h.p. of electric motors, power for 7,369 h.p. of which was purchased.

Mansfield and Foreign Cables.

The Mansfield Town Council has received a letter from Sir John Corcoran, a director of the National Union of Manufacturers, in which that Council's action in buying foreign electric cable is criticised, and this was the subject of discussion at last week's meeting. The chairman of the Electricity Committee, Coun. F. Hardy, said he thought the Council's action was already having an effect, because one of the firms associated with the cable manufacturers had reduced its price between 25 and 30 per cent. Coun. J. Pollard hoped the Committee would continue to buy cable from Holland in order to break the "rings" among English manufacturers. Ald. Norris said the remedy was for the people of this country to take the matter in hand and formulate a policy to find work for British workers.

New Italian Companies.

Among the concerns recently formed in connection with electricity supply in Italy are the Società Illuminazione Elettrica Vetture, Milan, capital 60,000 lire; La Società Elettrica Buonalbergo Casalbare, Buenalbergo (Benevento), capital 300,000 lire; La Società Idroelettrica Val d'Agri di Missanello, Missanello (Potenza), capital 100,000 lire; and La Società Elettrica Rinascenza, Nicastro, capital 500,000 lire.

New Belgian Companies.

Eclairage et Force Motrice reports the formation of the following companies in Belgium:—Société Anonyme "Kalovik," Schaerbeek, capital 300,000 fr., to manufacture and deal in electrical appliances; Société Anonyme pour l'Exploitation d'Appareils Electro-pneumatiques, Brussels, capital 150,000 fr.; Ateliers de Constructions Electromécaniques de l'Est de Liége, capital 1,150,000 fr., to manufacture electrical machinery of all kinds, transmission apparatus, &c.; and the Société Franco-Belge de T.S.F. (Paris), capital 100,000 fr., to manufacture electrical and radio apparatus.

Berry's Electric, Ltd., and the McClary Cooker.

Some years ago we made the acquaintance of the McClary electric cooker—a Canadian production, which has attained wide popularity in that country and has been very well received on this side of the water, several electricity supply authorities having commended it highly. The cooker is enamelled inside and outside, and the oven is fitted with removable elements and racks, so that the whole of the interior can be cleaned with ease. The hotplates, which are of the totally-enclosed type, are also removable. We learn

Berry's Electric, Ltd., New Cooker Factory.

with interest that Berry's Electric, Ltd., which has not hitherto made cookers, has acquired the sole rights to manufacture and sell the McClary cooker in Great Britain and Ireland, and is erecting a large extension to its Birmingham works wholly for this purpose; the accompanying illustration shows the interior of the new workshops, which are being got into shape as quickly as possible, and will be completed by the end of June.

We have been requested by Messrs. Berry's Electric, Ltd., to pass on to members of the I.M.E.A. and E.A.W., and visitors, a cordial invitation to visit their Buxton showrooms at 2a, Station Approach. Among the outstanding attractions will be a replica of the "Magicoal" fire designed for the new residence of the Duke and Duchess of York, and approved by the Queen. There will also be continuous cookery demonstrations with the McClary cookers, and exhibitions of clothes washing, ironing, and refrigeration.

Social Event.

The Rugby team of the Chloride Electrical Storage Co., Ltd., has distinguished itself by winning for the second time the Workshops Cup Competition organised by the Broughton Rangers Rugby Football Club. The final was played on May 7th, when the Chloride team defeated the Salford Municipal Employés' team by 9 points to 2 points. The team previously won this cup in season 1924-25, while last season it reached the final.

United States Electrical Exports.

During March electrical goods to the value of $8,551,561 were exported from the United States. This was $34,781 less than the total for March, 1926, but $1,548,079 more than the February figure. The value of goods shipped during the first four months of this year was $23,200,000, about $600,000 more than in the corresponding period of 1926. The principal increases occurring in March, as compared with March, 1926, were for telegraph apparatus and railway signals, switches and attachments. The latter group rose in value by $103,841. The electric lamp class recorded a rise of $85,276. Other important increases occurred in insulated copper wire and cable electrodes for electric furnaces, mining and industrial locomotives, motor-driven household devices, batteries, switches and circuit breakers over 10 A, and portable electric tools. Among the decreases were transmission and distribution apparatus ($319,097), switchboard panels (except telephone) showing the largest fall ($238,196), transforming and converting apparatus ($227,773), electric motors, instruments, radio apparatus, domestic heating and cooking appliances, &c.

Unemployment.

The number of registered unemployed decreased by 23,428 during the week ended May 9th, and thus fell below the million mark. The actual total was 998,300, as compared with 1,021,728 on May 2nd and 1,875,899 on May 10th, 1926 (general strike period).

Wages in the Engineering Industry.

A further stage in the negotiations for increased wages in the engineering industry was reached last week. It will be remembered that the trade unions concerned originally asked for an all-round rise of 20s. per week. After lengthy discussions the employers decided that they were unable to accede to this demand, and offered instead an increase of 2s. 6d. per week, subject to certain conditions relating to overtime and night work. The unions considered that the offer left matters much as they were, and declined it. Then the general strike intervened and nothing further was done until early this year. Last week representatives of both parties met again in London. Sir Allan Smith, who presided, reviewed conditions in the industry, and on behalf of the Engineering Employers' Federation again offered a 2s. 6d. increase subject to conditions, with a proviso that the position and prospects of the industry should be reviewed again in July, 1928. The trade union representatives considered that this offer was identical with the previous one, and said that they could not accept it. As an alternative, they suggested an advance of 5s. per week to be made in two stages on July 1st and September 1st. The employers were unable to agree to this and, as a counter-proposal, offered a special advance to time workers of 2s. per week on the war bonus as from August 1st, wages then to be stabilised for 12 months. The union representatives declined this offer, and the conference broke up.

Trade Announcements.

MESSRS. L. WEEKES (LUTON), LTD., state that their business has not been amalgamated with, or absorbed by, any other similar business, nor is there any intention of this nature. They will continue to manufacture their "Safetee" ironclad switches, enclosed indicating cartridge fuses, &c., as hitherto.

The AUTOMATIC COIL WINDER & EQUIPMENT CO., LTD., has been appointed sole distributing agent for "Zeva" electric soldering irons and crucibles.

On and after May 29th the address of B.E.N. PATENTS, LTD., will be 92, Tottenham Court Road, W.C.1 (telephone: Museum 1761/2). The new premises comprise a showroom, a demonstration room, offices, a repair department and stores.

MESSRS. CUNNINGHAM, LTD., have had additional telephone lines installed; the new numbers are: Paddington 9001, 2 and 3.

MR. E. D. CHAPMAN has commenced business as an electrical and wireless engineer at 6, Station Parade, Croxley Green, Herts.

After serving with Messrs. Falk, Stadelmann & Co., Ltd., for seven years, Mr. L. E. FRASER is leaving on June 1st to take up agencies in the electrical and hardware trades. He has an office at 20-21, Finsbury Court, Moorgate, E.C.2. (Telephone: Clerkenwell 1003).

MESSRS. GREEN & SMITH, LTD., Meadow Lane, Leeds, have purchased the business of Messrs. Wallis & Watson, electrical contractors, Leeds; the business will be continued under the same name, and Mr. W. S. McGregor, the manager, and the whole of the staff have been retained. A brochure and leaflets dealing with the company's activities have been received.

ASCOG, LTD., has removed to Ascog House, 44, Theobald's Road, W.C.1. Telephone No.: Fitzroy 1537. Telegraphic address: "Oamcogeta, Holb-London."

MESSRS. BROWETT, LINDLEY & CO., LTD., have appointed Messrs. Green & Jackson, 12, Cherry Street, Birmingham, to be their representatives for the Midland District.

RADIO INSTRUMENTS, LTD., and the wireless section of the VARLEY MAGNET CO. have recently been amalgamated. Mr. J. Joseph, the managing director of Radio Instruments, Ltd., and Mr. J. M. G. Rees, of the Varley Magnet Co., are the directors of the new combination, which is known as R.I. and Varley, Ltd.

New Catalogues and Lists.

BROOK MOTORS, LTD., Empress Works, Huddersfield.—Catalogue No. 157, containing particulars and prices of "Brook" two- and three-phase loom motors. Also List No. 164, giving details of the company's hire-purchase system.

THE CONSOLIDATED PNEUMATIC TOOL CO., LTD., 170, Piccadilly, W.1.—Catalogue No. 14, containing illustrated details of portable electric tools, and three pamphlets advertising pneumatic tools.

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38-39, Upper Thames Street, E.C.4.—An illustrated price list of "Siemens" electric fans.

SOLEX, LTD., 223-231, Marylebone Road, N.W.1.—A booklet dealing with engine efficiency and the remedying of troubles in automobiles.

MESSRS. RANSOMES, SIMS & JEFFERIES, LTD., Orwell Works, Ipswich.—A handsome brochure illustrating many examples of the company's lawn mowers, including electrically-operated types.

SIR W. H. BAILEY & CO., LTD., Albion Works, Salford, Manchester,—List No. 3,326, containing illustrated particulars of high-speed single-acting air compressors and vacuum pumps.

MESSRS. MAVOR & COULSON, LTD., 47, Broad Street, Mile End, Glasgow.—Lists Nos. 171/3, describing ironclad distribution panels, and 261/5, dealing with ironclad control pillars. Well illustrated.

THE UNIVERSAL MANUFACTURING CO., 7c, St. George's Circus, S.E.1.—A price list of electric fans, including desk and ceiling types.

THE LONDON ELECTRIC WIRE CO. & SMITHS, LTD., Playhouse Yard, Golden Lane, E.C.1.—A pamphlet announcing reductions in the prices of "Lewcos" two-pin inductance coils.

THE BRITISH TAP & DIE CO., LTD., Stirling Road, Walthamstow, E.17.—A leaflet containing prices and particulars of stocks and dies for screwing electrical conduits.

MESSRS. WINGROVE & ROGERS, LTD., 63, Queen Victoria Street, E.C.4.—A brochure illustrating examples of the company's electric locomotives, trucks and tractors, with full technical details.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—The "Osram-G.E.C. Bulletin" for May, containing illustrated articles and notes on "Osram" lighting installations, "Osram" radio valves, "Magnet" domestic appliances, &c. Also a circular letter dealing with "Geeko" moulded accumulators.

THE STURTEVANT ENGINEERING CO., LTD., 147, Queen Victoria Street, E.C.4.—A profusely illustrated booklet describing the construction and use of the company's industrial turbine vacuum cleaners. Many views of their applications are reproduced.

THE CAMPBELL GAS ENGINE CO., LTD., 73a, Queen Victoria Street, E.C.4.—A brochure entitled "The Price of Power," dealing in a non-technical manner with the advantages of independent internal-combustion engine sets for driving machinery and generators.

BURNDEPT WIRELESS, LTD., Blackheath, S.E.3.—An illustrated and priced booklet describing fully the company's five-valve portable receiver.

WELDRICS (1922), LTD., Station Road, Beeston, Notts.—A series of illustrated pamphlets describing the company's arc-welding plant, electrodes, &c.

MESSRS. NEWTON & WRIGHT, LTD., 471-473, Hornsey Road, N.19.—A comprehensive catalogue of apparatus for radiology, containing illustrated particulars of X-ray equipment of many types.

MESSRS. STUART TURNER, LTD., 43-47, Market Place, Henley-on-Thames.—Pamphlets dealing with a small plant for charging high- and low-tension radio batteries. Fully illustrated and priced.

MESSRS. J. J. EASTICK & SONS, 118, Bunhill Row, E.C.1.—A series of advertisements dealing with radio components supplied by the firm.

THE L. P. S. ELECTRICAL CO., LTD., Avenue Road, Acton, W.3.—A catalogue of magnet wires, giving prices and winding data.

THE SUPERHEATER CO., LTD., 195, Strand, W.C.2.—Pamphlets Nos. S.1 dealing with superheaters for power plants; S.2, a report on tests of a steam generating unit at an American generating station; and S.3, describing "M.L.S." bifurcated tube water walls. Well illustrated.

IRON AND NICKEL BATTERY CO., LTD., 17-19, Cockspur Street, S.W.1.—An illustrated pamphlet advertising "Ionic" (nickel-iron) batteries for yacht lighting, and also the company's hand lamp.

WAGNER ELECTRIC SUPPLIES, LTD., 66, Victoria Street, S.W.1.—List 24E, giving particulars and prices of single-phase repulsion-induction motors.

Bankruptcy Proceedings.

H. W. BAYLIS, company director, Aldwych House, W.C.2.—The affairs of this debtor, who died last December, came before Mr. Justice Astbury, sitting on May 16th as bankruptcy judge in the Chancery Division, upon an appeal against the rejection by the trustee of a proof of debt for £22,000. The receiving order was made against the debtor's estate on November 2nd, 1926, and accounts were lodged showing total liabilities of £17,752 (unsecured £13,460), against assets valued at £710, the failure being attributed to liability under a guarantee given on behalf of Radio Phonopore and Electricals, Ltd., of which company the debtor acted as director until it went into liquidation in June, 1926. Mr. Spens, K.C., said he appeared on behalf of Mrs. Anna T. Baylis (debtor's widow) and the Revd. O. F. Walton, who were the trustees under a deed of separation, and the appellants against the decision of Mr. F. S. Salaman (the trustee under the bankruptcy) rejecting their proof of debt to the extent of £22,000. They asked the Court to admit the proof for the full amount of the debt. Counsel explained that under a deed of separation the debtor covenanted that within 12 months from the date of his death a sum, *inter alia*, of £22,000 would be paid to the trustees under the deed. Mr. Clayton, K.C., intimated that the trustee would not further oppose the appeal.

His Lordship made an order for the proof to be admitted for the full amount.

BARNEY PACIFICO (trading as B. H. Pacy), late of Southampton Row, W.C., dealer in electrical fittings.—This bankrupt, who failed in January, 1921, applied on May 17th to Mr. Registrar Mellor at the London Bankruptcy Court for an order of discharge. The Official Receiver reported that the debtor commenced business in January, 1918, with £500 capital. He traded until the following December, when, owing to the business having been carried on at a loss, he closed it. The liabilities were returned at £395, and no assets were disclosed. The discharge was suspended for 12 month on statutory grounds.

A. A. SMETHURST, trading as A. Smethurst & Co., 62, Bernard Street, Southampton, electrical and wireless engineer.—The public examination of this debtor was held recently at the Court House, Southampton. According to the statement of affairs the liabilities totalled £1,077, against assets of £315. Debtor stated that in 1905 he commenced business on his own account with £5, undertaking a certain contract. His business was very successful, and he was able to purchase the freehold of the premises, putting down £750 of the £1,250 required. During the war he did very well on Admiralty contracts for the provision of wireless apparatus to trawlers and other vessels, and received a claim for between £3,000 and £4,000 for excess profits duty. He found it inconvenient to withdraw the money from the business at the time, but he had since paid up to within £60 of the total claim. In 1921 he turned the business into a company. Subsequently, however, he had to assist the concern financially, providing about £2,500. As security for the loans which he made to the company, a debenture was issued for £2,100. Debtor said that his failure was due to the slump in shipping. He had been doing a turnover of from £10,000 to £12,000 a year. In 1924 the company was wound up, a receiver for the debenture holders having been appointed, and debtor was appointed to act as manager. At the beginning of 1926 debtor recommenced trading on his own account. He attributed his failure to excess profits duty payments and income tax, loss of work which he had been doing for a firm for years, and bad trade. The examination was formally adjourned.

H. A. S. GLENN, 95, Holderness Road, Hull, gramophone and wireless dealer.—The public examination of this debtor was held on May 16th at Hull. The statement of affairs showed liabilities of £667 and a deficiency of £474. Debtor attributed his failure to bad trade, wireless competition, and illness. The examination was closed.

A. L. WEEKES, 13, Crescent Road, Luton, Beds., electrical engineer.—The receiving order in this matter was made on April 28th, on a creditor's petition. The first meeting of the creditors was held on May 17th, at the Official Receiver's Office, Northampton. The following are creditors:—

	£		£
Dryden, T. H. ...	... 153	Cumberland Brown	... 182
Peter Thomas & Clark	... 184		

L. BELL (C. Bell), mechanical and electrical engineer, Joseph Street, Leeds Road, Bradford.—Trustee, Mr. J. Lund, 2, Darley Street, Bradford, appointed May 10th.

J. ATKINS (Atkins & Co.), electrical engineer, 59, Church Street, Tewkesbury, Electricity Works, Northleach, and High Street, Winchcombe.—Trustee, Mr. R. A. Rodgers, Coventry House, 3, South Place, E.C.2, appointed May 14th.

H. MILNES (H. Milnes & Son), plumber and electrician, 6, Trinity Street, Huddersfield.—Last day for proofs for dividend, June 1st. Trustee, Mr. A. Pontefract, 6, New Street, Huddersfield.

W. M. HORSFALL, Heath Lodge, Hooton, Cheshire, electrical engineer, carrying on business in Liverpool.—Third dividend of 6d. in the £ payable at the offices of the Official Receiver, 11, Dale Street, Liverpool.

H. ROBINSON, 41, Wigan Lane, Wigan, electrician and wireless and cycle dealer.—Last day for receipt of proofs for dividend, June 4th. Trustee, Mr. E. D. Symond, 11, Dale Street, Liverpool.

W. R. GRIGSBY, trading as the Wenham Lighting Corporation, 184, Gray's Inn Road, W.C.1, electrical factor.—Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C., released March 28th.

J. TURNER, 62, Blackburn Road, Great Harwood, Lancs., electrician.—Trustee, Mr. J. P. Duxbury, 27, Richmond Terrace, Blackburn, appointed May 18th.

Company Liquidations.

WIRELESS SERVICES, LTD.—A meeting of members is called for June 20th at 4, Charterhouse Square, E.C.1, to hear an account of the winding up from the liquidator, Mr. E. H. Hawkins.

RADIO VALVES, LTD.—A meeting of members is called for June 21st at 182, Temple Chambers, Temple Avenue, E.C.4, to hear an account of the winding up from the liquidator, Mr. W. H. Bevan.

COUGHLAN & TYRRELL, LTD.—A meeting of members is called for June 20th at Bilbao House, New Broad Street, E.C.2, to hear an account of the winding up from the liquidator, Mr. A. T. Keens.

INTERCHANGEABLE ELECTRIC SIGNS, LTD.—Winding up voluntarily. Liquidator, Mr. C. H. Seaton, 62, Brook Street, W.1. —Meeting of creditors held on May 24th. Particulars of claims to be sent in by June 24th.

DISTRICT LIGHTING SUPPLY, LTD.—Winding up voluntarily. Liquidator, Mr. C. S. Steel, 34-36, Gresham Street, E.C. Meeting of creditors to-day (Friday) at Cannon Street Hotel, E.C.4.

Private Arrangements.

R. F. HEARN, 9, South Wharf, Paddington, electrical and heating engineer.—A meeting of creditors was held on May 18th, when Mr. W. F. Baker, of Messrs. Haynes & Baker, 97, Mortimer Street, W.1, said that the liabilities amounted to £1,641, all due to trade creditors, with the exception of £100, which had been lent by a daughter. The assets, after deducting £40 for preferential claims, amounted to £1,054, but that amount was subject to realisation. The debtor had carried on business since 1915. He attributed his position to losses amounting to £1,700 in connection with contracts carried out for an architect; he claimed that that amount was due to him. It was decided that a deed of assignment should be executed in favour of Mr. Baker as trustee, together with a committee of inspection. The committee was empowered to negotiate for the sale of the assets for a sum sufficient to pay 10s. in the £. The following are creditors:—

	£		£
Ashby & Warner, Ltd.	70	Hartley & Sugden ...	60
Brooks, Phillips & Co. ...	37	Hearn, Miss	100
Boldings, Ltd.	48	Lichtwitz & Peasey ...	82
Crane Bennett, Ltd. ...	70	Matts & Co., Ltd. ...	82
Croggon & Co.	39	Matthews & Yates, Ltd.	40
Digby & Co., Ltd. ...	434	McDowall, Steven & Co.	40
Evered & Co.	80	National Radiator Co. ...	197
Garrod & Co., Ltd. ...	46	Walworth-Munzing, Ltd.	81

ACTON BROS., electrical and wireless manufacturers, 33, Edmund Street, Camberwell, S.E.—A meeting of creditors was held on May 18th at the offices of Messrs. H. Rainsbury & Co., 65, Basinghall Street, E.C., when a statement of affairs was presented, which showed liabilities of £317, whilst there were rates and rent owing to the extent of £13. The assets were estimated to realise £196. Mr. H. Rainsbury reported that the debtors, Messrs. N. E. and E. O. Acton, started trading about five years ago at Walworth Road. They were successful, and in December, 1925, they moved to larger premises. Since that time, however, the business had declined, and from time to time they borrowed money from their father, who was now a creditor for £80. The father also guaranteed an overdraft of £86 at the bank. Efforts were made to sell the business as a going concern, but two creditors commenced proceedings, and it therefore became necessary to call a meeting. Mr. Rainsbury stated that no offer of composition could be submitted. The creditors decided that the estate should be realised by Mr. Rainsbury as trustee.

Dissolutions of Partnership.

LANGHAM (DIAMOND CLEAR) RADIO, wireless dealers, Albion House, New Oxford Street, W.C.—Mr. M. Baynes and Mr. H. H. Havercroft have dissolved partnership. Mr. Baynes will attend to debts.

W. T. CANNING & Co., electrical, motor and general engineers, 47, Goldhawk Road, W.12.—Messrs. H. J. Blissett and W. Canning have dissolved partnership. Mr. Canning will attend to debts and continue the business.

RANBURN MAGNETO Co., 26, Seymour Place, Marylebone.—Messrs. C. W. Pizzey, G. F. Rance, and W. H. A. Wood have dissolved partnership. Debts will be attended to by Mr. Wood, who will continue the business.

The Enforcement of Wage Agreements.

Under existing conditions wage agreements arrived at by Joint Industrial Councils only apply to members of those councils, and as a consequence these organised employers are often undercut by other employers who are not bound by the agreements. Accordingly a Bill is being re-introduced into Parliament which seeks to empower the Minister of Labour to make applicable to the whole industry any agreement made by a Joint Industrial Council where the latter so desires. A group of Conservative Members of Parliament, headed by Sir Cooper Rawson, has issued a manifesto calling for the Government's support of this Industrial Council's Bill. It is stated that several councils have come to the conclusion that their continued existence will be useless unless legislation of the nature proposed is secured. As an example, the Whitley Council for the Granite and Roadstone Quarrying Industry is cited. This Council has made a wage agreement, but the parties to it are seriously affected by the refusal of local authorities and private firms which own quarries to fall in with the arrangement. Eight councils are said to have been disbanded owing to the lack of the powers asked for. It is pointed out that as a Whitley Council represents at least 75 per cent. of those engaged in a particular industry, the effect of the Bill would be simply to bring the majority into line. The Bill passed its second reading in 1924 by a majority of 220 and probably would have become law but for the dissolution. It is anticipated that the same support is available, and it is said that the National Union of Manufacturers and the Trade Union Congress both support the Bill in principle.

The effect of the legalisation of agreements upon the electrical industry is dealt with in the May *Journal* of the Electrical Trades Union by the general secretary (Mr. J. Rowan). He says:—"It has been made very clear to the Ministry that compulsory arbitration is not to be a condition of such enforcement, and that the present procedure of the various joint councils shall continue—namely, that before arbitration can take place both sides must voluntarily agree. There is no doubt that if some such legislation could be given effect to, it would make an enormous difference to electrical installation work. It would even have a good effect on electricity supply, as we have had the spectacle of authorised undertakings actually leaving the National Joint Industrial Council rather than comply with voluntary agreements entered into jointly by the Council."

Business Opportunity in Buenos Aires.

We have been asked by a company with offices in Buenos Aires to put it in touch with British manufacturers or exporters of electrical cables, trolley wire, other wires for electrical purposes, electric lifts, electric lamps, fires, instruments, meters (a.c. and d.c.), turbines, dynamos, motors, conduits, electric motor-cars, electrical accessories, and novelties. British concerns who are open to appoint agents for export trade with Argentina, Chile, Uruguay, and Paraguay, and wish to communicate with the company mentioned are asked to write to the ELECTRICAL REVIEW "Service Department," 4, Ludgate Hill, London, E.C.4.

Book Notices.

"Central Station Voltages and Charges Throughout the United Kingdom, 1927." London: S. Rentell & Co., Ltd. Price 1s. net.—This booklet contains the latest information available at the time of printing as to the supply voltages, systems, and charges of the principal central stations in the United Kingdom.

"The New European Coal War" (29 pp.). London: Fleetgate Publications. Price 2d.—This is a report of the mission of miners' leaders to the Continent under the auspices of the *Daily News*, and is a concise and interesting review mainly of the German coal-mining and allied industries. The position of the electrical power industry is shown in its relation to other branches.

The Summer number of *Punch* (1s.) has been issued this week. It is full of fun and good humour, almost entirely pictorial.

"Underground Systems for Electric Light and Power," by T. C. Ruhling. Pp. viii+346; figs. 221. London: McGraw-Hill Publishing Co., Ltd. Price 20s.

"Automatic Telephony," by C. W. Wilman. Pp. vii+223; figs. 76. London: Crosby Lockwood & Son. Price 7s. 6d. net.

"Principles of Mercury Arc Rectifiers and their Circuits," by D. C. Prince and F. B. Vogdes. Pp. ix+233; 155 figs. Price 15s. "Properties and Testing of Magnetic Materials," by T. Spooner. Pp. xiv+385; 223 figs. Price 25s. London: McGraw-Hill Publishing Co., Ltd.

Electrical Patents in the United States.

Mr. Gerard Swope, president of the American National Electrical Manufacturers' Association, has appointed a committee of seven from prominent electrical concerns to investigate the situation regarding patents in the electrical industry, to determine whether some modification of the plan utilised by the National Automobile Chamber of Commerce may be made applicable to the electrical manufacturing industry. The committee comprises Messrs. Kebler, president, Ward Leonard Electric Co., chairman; A. G. Davis, vice-president, General Electric Co.; A. Atwater Kent, president, Atwater Kent Mfg. Co.; M. C. Rypinski, vice-president, Federal Brandes Co.; B. E. Salisbury, president, Pass and Seymour, Inc.; Harold Smith, general solicitor, Westinghouse Electric and Manufacturing Co.; and C. H. Strawbridge, president, Goodman Manufacturing Co. Messrs. A. E. Waller, managing director, and F. E. Neagle, legal counsel of the Association, are *ex-officio* members.

For Sale.

The South London Merchandise Mart will sell by auction on June 2nd, at 10, Red Lion Passage, Red Lion Square, W.C., the electrical and wireless stock of Claremont, Johnson, Ltd. (in liquidation). Bradford Corporation Electricity Department invites offers for one Babcock & Wilcox land-type water-tube boiler, with chain-grate stoker, &c., two Hall's boiler feed pumps, three induced-draught fans, two wrought-iron tanks, &c. Great Yarmouth Electricity Supply and Tramways Departments have for disposal one 600-kW single-phase Brush-Parsons turbo set, complete with surface condenser. (See our advertisement pages to-day.)

New French Company.

A new company has lately been formed at Clichy (149, Boulevard Jean-Jaures) (Seine), with a capital of 650,000 fr. and the title La Société des Etablissements de la Lampe Styx et Fragor Réunis, to manufacture telephone, telegraph, and radio apparatus.

German Materials for Victoria.

The Melbourne correspondent of the *Financial Times* reports that the Victorian State Electricity Commission has ordered material to the amount of £43,245 from German firms. Tenders for one lot of goods were received as follows:—One from England, two from America, and three from Germany. It was found that, allowing for the British preference from the tariff, the English price was 16.7 per cent. higher than that of Orenstein Koppel, of Berlin, which was accepted. The amount involved in this tender is £20,230. An order for six trucks of 20 tons each was given to Fried. Krupp, Berlin; a locomotive is to be ordered from Siemens Schuckertwerke, and cranes costing £1,983 from the Seyboth Co., Germany. The Commission claims that delivery by the Germans will be less than half the time mentioned in the British tender.

Scottish Electricians' Wages.

The Scottish District Joint Industrial Council for the Electricity Supply Industry has approved of an increase of wages to the extent of 1d. per hour to certain classes of employés in the industry.

The British Industries Fair, 1928.

We have received the prospectus of the next British Industries Fair, to be held at Castle Bromwich, Birmingham, from February 20th to March 2nd, 1928. This can be obtained from Mr. C. Stanley, the general manager, Birmingham Chamber of Commerce, 95, New Street.

Prices of Raw Materials.

In their weekly report on the lead market, Messrs. James Forster & Co. state:—"No new feature is apparent in the position. Stocks are considerable, supplies are ample, and consumption is still only moderate. It is rather astonishing that, in spite of the lower price for lead ruling this year, production actually shows an increase, one authority giving it as 33,000 tons over last year for the first quarter. Of course, this has already been discounted in present values, and it will be interesting to see what effect these values will have on present production. Unless producers curtail their output it seems certain that prices will fall still lower, until it becomes unprofitable for some of the more expensive mines to carry on."

Messrs. F. Smith & Co. and Messrs. James & Shakespeare report, May 24th:—No change in copper prices.

Messrs. James & Shakespeare report, May 24th:—English pig lead, £26, 5s. dec.

Messrs. Edward Till & Co. report, May 24th:—No change in the price of India-rubber, Para fine.

Lighting and Power Notes.

Blackburn.—INQUIRY.—The Corporation General Purposes Committee has appointed Dr. S. L. Pearce to conduct an inquiry into the electricity undertaking, which is being held at the request of the electrical engineer (Mr. P. P. Wheelwright). The Committee has requested Dr. Pearce to examine the organisation and arrangement of the department, with its relations to other departments and to make any recommendation he may think proper to perfect the administration.

Bridgnorth.—ELECTRICITY SUPPLY.—At a recent meeting of the Town Council and General Purposes Committee reported that it had had an interview with the chief engineer of the Shropshire, Worcestershire and Staffordshire Electric Power Co. regarding a supply of electricity to the town. The engineer stated that by the end of the year, or early in 1928, cables would be extended from the Stourport power station to Bridgnorth, and that the Corporation would have to incur no capital outlay.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—The Dominion Government has been devoting attention to power development on the Ottawa River, and the Minister of Railways and Canals announces that the charter of the National Hydro-Electric Company of Montreal, authorising it to develop electricity on a large scale at Carillon Falls will not be renewed. If the plans now being considered by the Federal Government are carried out, the Government itself will proceed with the Carillon Falls development for the benefit of Ontario and Quebec. It is estimated that 400,000 h.p. will be available at the Carillon rapids, incidental to the deepening of the Carillon and Glanville Canals from 9 ft. to 14 ft., at a cost of $40,000,000. There will have to be some negotiations with Ontario and Quebec, as both provinces may question the legal right of the Federal Government to develop power on the Ottawa River, and, failure to come to an agreement, may necessitate reference to the Privy Council.

Chesterfield.—YEAR'S WORKING.—Mr. D. H. Davies, borough electrical engineer, informs us that the sales of electricity for the year ended March 31st last amounted to 8,199,676 kWh, an increase of 7 per cent., as compared with the preceding year. The cost of coal increased by over £7,000, and the cost per kWh sold from 0.21d. to 0.42d. The total working costs per kWh amounted to 0.99d., as against 0.77d., and the average price obtained was 1.60d. per kWh. Notwithstanding the heavy increases in the coal costs, the charges for electricity were reduced by ½d. per kWh for lighting, and by 10 per cent. for power, resulting in a reduced net profit of £2,522. This was done because at March 31st, 1926, the reserve fund had exceeded the statutory limit allowed. The connected load increased by 2,300 kW, the total now being 19,838 h.p. An addition of 21 miles of mains was made to the distribution system, bringing the total up to 134 miles. The sales of electricity for heating and cooking increased by 111 per cent., which was largely due to the opening of a new showroom during the year. Cookers, fires, wash boilers, &c., let out on hire during the year totalled 539.

Continental.—BELGIUM.—The reports that are being issued by the various electricity supply undertakings in Belgium show that steady progress continues to be made. The report of the Société de la Centrale Electrique de l'Entre Sambre-et-Meuse for the past year shows that it is now supplying electricity to over 30,000 consumers in the provinces of Namur, Hainaut, and Brabant, an increase of about 3,000, as compared with the preceding year. The load of the Société Intercommunale Belge d'Electricité, which controls eight power stations, increased to 256,000 kW, as against 227,000 kW, the sales of electricity showing an increase of 21 per cent. over 1925. During the past year the supply contracts secured by the Société d'Electricité du Bassin de Charleroi increased from 43,398 kW to 52,522 kW, to meet which 30 miles of new mains were laid. The Société d'Electricité du Nord de la Belgique is now supplying electricity to 115 localities in its area, as against 100 a year ago. The company has a total of 52,371 consumers, representing a load of 63,147 kW, to supply which the distribution system has been increased to a length of 1,165 miles.

The Société d'Electricité de la Region de Malmedy, in its report for last year, states that good progress is being made with the construction of the Beverce hydro-electric power station on the River Warch. The station will comprise three 5,500-h.p. turbo-generators, the foundations for which have already been completed. Pending the completion of the station, a steam-operated plant of 2,000-kW capacity has been established at Malmedy, a 15,000-V transmission line erected between Malmedy and Saint Vith, a distance of about 22 miles, and a similar line between Malmedy and Trois Ponts for the supply of electricity to the Compagnie d'Electricité des Ardennes.

FRANCE.—The Société de l'Union d'Electricité, of Paris, is augmenting its electricity supply in the Paris district by power transmitted from the Eguzon hydro-electric station, completed last year. The steam-operated station at Gennevilliers, near Paris, has now a capacity of 340,000 kW. During last year the output of the Union Co. amounted to 749 million kWh, as against 671 million kWh in 1925. Part of the increase is explained by the fact that the Union Co. is now supplying the electricity for all the electrified lines of the Paris-Orleans Railway Co.

AUSTRIA.—At the recent annual meeting of the Oberosterreichische Wasserkraft und Elektricitäts Gesellschaft in Linz it was reported that the output of the O.W.E.A.G. hydro-electric power station at Partenstein had increased from 39,974,640 kWh in 1925 to 73,238,680 kWh last year. The third turbo-generator has recently been completed and put into operation, bringing the capacity of the plant up to 45,000 h.p.

El Salvador.—ELECTRICAL DEVELOPMENT.—A contract will shortly be placed for the installation of two electric light plants, either separately or as a whole, for Chinameca (Department of San Miguel), and for Jujutla (Department of Ahuachapan).—*Reuter's Trade Service* (San Salvador).

Guildford.—SPECIAL ORDER.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Corporation to supply electricity within parts of the rural districts of Guildford and Hambledon.

Hastings.—NEW COOLING TOWERS.—The Town Council has decided to erect new cooling towers at the Broomgrove power station, at an estimated cost of £6,974.

LOANS.—Application has been made for sanction to loans of £10,000 for services and £5,000 for meters.

Helensburgh.—LOAN.—The Town Council is to apply for sanction to the borrowing of £25,000 for the purpose of meeting capital expenditure incurred and to be incurred in connection with its Special Order.

Japan.—TOKIO.—The Tokio Denko K.K. has applied to the Government for permission to extend the capacity of its Tsurumi power station from 70,000 kW to 200,000 kW.

Leatherhead.—NEW PLANT.—The Leatherhead and District Electricity Co., Ltd., has received sanction to the installation of a 1,000-kW set at its electricity works. This is required to meet increasing demands, and will also enable the company to provide a bulk supply to any neighbouring undertaking requiring such a service.

London.—WATER WORKS PLANT.—The Metropolitan Water Board has prepared a scheme for the installation of new plant at its Hampton works. It is proposed to replace the existing two generators working at 100 V with two new sets generating at 200 V. The estimated total cost of installing two new generators with new motors, cables, &c., where necessary, and replacing the "Sheffield" engines with electrically-driven pumps, amounts to £9,000. There would be an approximate annual saving in wages of over £1,000, while the fuel charges would not be any higher. The question of the supply of electricity by the local company as against its provision by the Board has been considered, and it is found that by generating at Riverdale works the annual cost would amount to £4,000, a sum very much below that which would be charged by the company.

STEPNEY.—The Electricity Committee has received an application from Bermondsey Borough Council for a supply of electricity in bulk, and has recommended that terms be arranged and an agreement entered into for such a supply to Bermondsey.

Long Eaton.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £17,285 for the installation of two 500-kW transformers at the power station, the erection of two sub-stations, and h.p. cables.

Lowestoft.—ELECTRICITY AGREEMENT.—The Corporation has considered the draft agreement with the Great Yarmouth Corporation relative to the bulk supply of electricity to Lowestoft, and has agreed that the draft shall be submitted to the Electricity Commissioners to determine the points at issue.

Northern Ireland.—PORTSTEWART (CO. DERRY).—At a recent meeting of the Urban District Council the town surveyor submitted a draft plan of the proposed new generating station. The approximate cost of the station is estimated at £1,400, with manager's residence and office £750, and store £100, a total of £2,250. The clerk said the cost of the machinery, including new engines, switchboard, and generators, would be about £2,750, which would bring the total cost of the station to about £5,000.

BALLYCASTLE (CO. ANTRIM).—At a special meeting of Ballycastle Urban Council a communication was read from Mr. Dashwood, electrical engineer, Belfast, with reference to the valuation of the existing plant, mains, &c., of the electricity undertaking owned by the Ballycastle Lighting Co. Mr. Dashwood estimates the value of the plant, including goodwill, at £4,024. This sum does not include any fuel oil or other stores. An additional expenditure spread over the next five years of £1,500 would be required, part of which could be provided out of revenue. If the Council decides to move the station and provide new buildings, the cost of this work would be under £1,000. The Council has decided to make an offer of £4,024 to the Ballycastle Electric Lighting Co.

Prestatyn.—INAUGURATION OF SUPPLY.—An electricity supply for the district was formally inaugurated by the chairman of the Electricity Committee on May 14th. Electricity is obtained in bulk from the North Wales Power Co., Ltd., at 11,500 V, and reduced at the Council's sub-station for distribution. The charge for lighting is 8½d. per kWh.

Preston.—LOAN.—Application is being made for sanction to borrow £10,000 to meet the estimated expenditure for the assisted wiring scheme for the ensuing 12 months. The Housing Committee has been requested to take advantage of the system in connection with two schemes which it has in hand.

LOANS SANCTIONED.—The Commissioners have sanctioned loans of £82,151 and £48,000 respectively for the provision of mains, services, &c., and the installation of a fourth turbo-generator at the Ribble power station.

Sheffield.—ALL-ELECTRIC HOUSES.—A proposal to introduce electricity into 30 of the houses in course of erection by the Corporation on the Longley estate is to come before the next meeting of the City Council. The scheme provides for electric fires, cookers, boilers, &c. Previously all the Corporation houses have been fitted for electric lighting, but the occupiers have had to provide any additional appliances.

Shrewsbury.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking show a gross profit of £7,221, and after providing for capital charges, a net surplus of £2,931, of which £2,000 was placed to reserve account and the balance carried forward.

ELECTRICITY EXTENSIONS.—The Electricity Committee has recommended extensions at a cost of £1,230.

Stourport.—NEW POWER STATION.—The new power station of the Shropshire, Worcestershire and Staffordshire Electric Power Co., which will be inaugurated on June 2nd, will work interdependently with the Electricity Supply Department of the Birmingham Corporation, and for this purpose a cable has been laid between the company's station at Halesowen and the Corporation's undertaking. This is to be put into operation within the near future, and the stations of the company at Smethwick, Halesowen, Kidderminster and other centres will then be connected with the Corporation stations at Nechells and Summer Lane. The initial plant at the Stourport station provides for the development of 50,000 h.p., there being two turbo-alternators, each of 22,500 kVA, generating at 3-phase, 25 cycles, 5,500 V, which will be stepped up to 33,000 V for transmission. The station will eventually be enlarged to a capacity of 200,000 h.p.

Stoke-on-Trent.—EXTENSION OF SUPPLY.—At a recent meeting of the Electricity Committee an inquiry was received from the English Electric Co., Ltd., regarding an electricity supply required by Messrs. Wheatley & Co., at Springfield Tileries, Stone Road. It was decided to lay an e.h.p. main from the London Road sub-station, at an estimated cost of £6,500. The Committee is to extend mains at Pittshill, at a cost of £1,200.

SUPPLY FOR GAS WORKS.—The Corporation gas engineer is negotiating with the city electrical engineer for a supply of electricity to the Etruria gas works.

CHANGE-OVER.—The electrical engineer has submitted a report to the Electricity Committee on the proposed method of changing over the system of electricity supply in the centre of Tunstall from d.c. to a.c. The work will be carried out in three sections, and the cost is estimated at £6,200.

STREET LIGHTING.—The Corporation has asked the city engineer to prepare a scheme for the improved lighting of the main roads in the city.

ALL-ELECTRIC HOUSES.—The Corporation has deferred for six months a proposal to equip 200 houses on the Abbey housing site as all-electric houses pending definite information as to the costs, &c., from the eight all-electric houses erected in Avenue Road, Hanley.

Swansea.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to carry out mains extensions, at a total estimated cost of £3,856. The borough electrical engineer has recommended, for the purpose of ensuring continuity of supply to the Gellyceidrim and Brynamman collieries and other consumers on the Amman Valley line, that a by-pass overhead transmission line be constructed at Gellyceidrim, at an estimated cost of £1,500. The Committee has approved the proposal.

United States.—ELECTRICAL DEVELOPMENT.—A new hydro-electric plant with a generating capacity of 56,000 h.p. will be erected immediately at Oxford Shoals, near Claremont, on the Catawba River, by the Southern Power Co. The plant will cost $5,000,000. Contracts have been let for the equipment of the new station, and much of the preeliminary work has already been done. It is stated that the plant will be in operation by June 1st, 1928. The Oxford Shoals hydro-electric plant will be the twelfth built by the Duke interests. The generating capacity of these plants will be, with the completion of the proposed station, 651,000 h.p..

Weymouth.—STREET LIGHTING.—The Town Council has arranged with the Wyke Parish Council for public lighting in the village by 40 lamps for a period of 20 years, at a charge of £145 per annum.

ELECTRICITY IN BULK.—The Council has also arranged to supply electricity in bulk to Portland Urban District Council at £5 per kVA, plus 0.7d. per kWh. The minimum to be paid by Portland is to be £350 for the first year, £525 for the second year, and £700 for the third and succeeding years. The Corporation is to apply for a Special Order authorising the bulk supply.

Whitchurch (Hants.).—ELECTRICITY SUPPLY.—The Rural District Council has decided to give its consent to an application by the Basingstoke Town Council for a Special Order to supply electricity in the district.

Tramway and Railway Notes.

Brighton.—EXTENSION OF ROUTE.—The Tramways Committee has recommended the extension of the Lewes Road route as double track from the terminus to the existing borough boundary, at an estimated cost of £2,800.

Continental.—POLAND.—The Société Chemins de fer Electriques Suburbains has obtained a concession for the construction and working of an electric railway, about 30 miles in length, between Warsaw, Grodzisk and Zyrardow. Work is well advanced on the construction of the line as far as Grodzisk, 20 miles, and this is expected to be put into operation in the near future.

GERMANY.—At the end of last year 585 miles of main-line railways and 70 miles of suburban lines had been electrified in Germany. Of the main lines 275 miles is in Bavaria, and of the suburban lines 50 miles is in the Berlin area. At the present time 190 miles of line is in course of electrification, including the Konigszell-Breslau mountain railway (30 miles), the Munich-Rosenheim-Kufstein line (62 miles), and about 100 miles of the Berlin city and local railways.

BELGIUM.—The electrification of the last section of the Brussels-Ninove local railway—that between Eyseringhen and Ninove—has recently been completed by the Société Nationale des Chemins de fer Vicinaux. To supply electricity for the new section an automatic transformer station, the first of its kind in Belgium, has been established at Eyseringhen.

Hull.—TRAMWAY SUPPLY.—At a recent meeting of the Corporation Electricity Committee it was reported that the Tramways Committee was considering the advisability of taking a supply of electricity for the tramway service from the general city supply instead of from the power station in Osborne Street. The matter was left over pending the receipt of a communication of the Tramways Committee on the subject.

Irish Free State.—CORK.—In consequence of motor-omnibus competition, the Cork Electric Tramways Co. has decided to extend its 1d. fare stage and to introduce a 2d. fare for the whole length of the route of five miles. If competition continues to increase, it is probable that the Corporation will supplement its tramway service by a 'bus service of its own.

Japan.—TOKIO-OSAKA RAILWAY.—In connection with the proposed rapid transit electric railway between Tokio and Osaka, it is reported that the Osaka Municipal Assembly will shortly give its approval to the scheme. The total length of the line will be 299 miles, and there will be only eight intermediate stations.

New Zealand.—AUCKLAND.—The Sydney *Sunday Times* reports that the proposed extension of the Auckland tramway to Point Chevalier, to Meadowbank Road on the Remuera line, and to Mount Albert Road on the Mount Eden, Dominion Road and Ebendale Road routes, as recommended by the tramway manager, Mr. A. E. Ford, has been approved by the City Council. The Council has also agreed to acquire 50 new trams and to add to the 'bus garage accommodation. The proposals are to come before the ratepayers in a loan poll to raise £500,000 to carry out the various works.

Southend-on-Sea.—INQUIRY RESULT.—In connection with the inquiry recently held by the Ministry of Transport into the Corporation's application for a Provisional Order authorising it to introduce a railless-car service from Victoria Circus to the Priory, thence *via* Brook Road, East Street, and Sutton Road to Victoria Circus, the Ministry states that it is unable to authorise the introduction of railless cars on this route at present, except on that portion of the route now in operation. The Council has decided, subject to obtaining the necessary Order, to purchase the two railless cars which have been in operation on this route since January last, at a cost of £1,650 each.

United States.—RAILWAY ELECTRIFICATION.—According to the *Electrical World*, the Pennsylvania Railroad has started to electrify the Octoraro branch of its system. This runs through Lansdowne, Morton, Media, Swarthmore, and West Chester. It is stated that the work will be completed early in 1928. Good progress is being made on the Pennsylvania's electrification between Philadelphia and Wilmington, which has been under way for a year.

Telegraph and Telephone Notes.

Radio-Telegraphy.—COLONIAL LINKS.—Wireless problems were discussed at the Colonial Conference in London on May 20th. The opinion was expressed that progress in the application of wireless-telegraphy was so rapid that the formulation of a definite general scheme for the Colonies would be premature. It was pointed out that the amount of work in the Colonies and Protectorates had not been very extensive. During the past 15 years about 30 small stations had been erected, and were utilised mainly for local requirements and communication with shipping, but they were regarded as the preliminary links in a chain of inter-Imperial communication which might ultimately be established. The adoption of a short-wave service between Singapore, Penang, and neighbouring States is contemplated by the Straits Settlements Government, and Kenya looks forward to being in a position to pick up short-wave transmissions from this country.

Switzerland.—TELEPHONE ASSOCIATION.—A number of concerns which supply telephone material to the Swiss Post and Telegraph Department have lately formed a new association with the title "Pro Telephon" to carry through a campaign to develop the use of the telephone in Switzerland. The offices of the new body are temporarily located at those of the Swiss Union of Electrotechnical Specialists, 5, Cacilienstrasse, Zurich.

Transatlantic Telephony.—EXTENSION OF HOURS.—The Postmaster-General announces that on and from May 23rd the transatlantic telephone service will be available from 12.30 p.m. to 11 p.m. (British summer time) daily, including Sundays.

Radio Notes.

Canada.—NEW STATION.—One of the most powerful stations in Canada is to be erected in Red Deer, Alberta, by the Alberta Pacific Grain Co. Studios will be operated in both Calgary and Edmonton by remote control from the main station, says *World Radio*. It is also announced that Alberta is to have a permanent radio inspector to serve the entire province, whose headquarters will be at Calgary.

Empire Broadcasting.—SERVICE URGED.—Since the end of 1925 the British Broadcasting Corporation has indicated its desire to co-operate in any practicable enterprise designed to interchange programmes between, or simply to make them available in, various parts of the Empire, but it has neither had the financial resources required for the necessary experiments, nor has it been convinced that any of the proposals so far made are likely to be productive of that degree of efficiency which would justify the expenditure involved. Nevertheless, it committed itself in May of last year to construct the necessary experimental apparatus and received Post Office permission to do so; it was proposed to test the opinion of representatives at the Colonial Conference this

week with a view to ascertaining the demand that may exist for such a service, and the extent to which they would be prepared to co-operate financially and otherwise.

Meeting in London on May 20th, the Colonial Conference delegates are reported to have expressed a desire for the formulation of a policy of broadcasting as a channel of communication and a means of entertainment, but stated that prolonged experiments would have to be made before a scheme of distribution throughout the Empire could be regarded as technically practicable in all respects. Ceylon took the lead in establishing a broadcasting service in 1924, and Hong Kong, Palestine, the Gold Coast, Cyprus, and Zanzibar have been considering the possibilities of setting up broadcasting services.

The Wireless League and the Wireless Association of Great Britain are urging the initiation of an Empire service, in which connection it is of interest to note that on the occasion of the relaying of the after-luncheon speeches from the Guildhall on May 18th, when the City of London entertained the President of the Republic of France, arrangements were made, on receipt of the speeches in the control room at 2LO, to transfer them to land lines so that they could be transmitted to Paris for simultaneous re-broadcasting from the French radio stations.

The Sydney (Australia) broadcasting station (2BL) successfully relayed the (5 to 8 p.m., May 20th) programme of the British Broadcasting Corporation's London station (2LO) between 3 and 6 a.m. on May 21st. The relay took place *via* the B.B.C.'s Daventry station (5XX, 1,600 m.) and the short-wave station of Messrs. Philips in Holland; it was relayed again by Broadcasters, Ltd., from Sydney to New Zealand, and in South Africa also from the Cape Town, Johannesburg, and Durban stations, while the programme was heard at Rangoon in India as well.

This feat of PCJJ, the Philips experimental station at Eindhoven, Holland, which broadcasts on a wave-length of 30.2 metres merits attention. Numerous amateurs in the Dutch East and West Indies have also testified to the excellence of the reception of this short-wave transmission. Holland has been one of the pioneers of the broadcasting industry; indeed, it was the old station at The Hague (PCGG) which English listeners were first able to hear long before the inauguration of the B.B.C.

Union Internationale de Radiophonie.—ANNUAL MEETING.—The annual meeting of the Union, consisting of the Council and various Commissions, has concluded its sittings at Lausanne. Vice-Admiral Carpendale (Great Britain) has been re-elected president of the Union; Messrs. H. Giesecke (Germany) and R. Tabouis (France) vice-presidents; and M. M. Rambert, delegate of the Council. Agreement was arrived at on certain questions, with regard to which experience has shown the need of international collaboration, which are to be discussed at the coming international conferences at Washington and Rome. The Lausanne conference also discussed the adjustment of some of the wave-lengths allocated in the Geneva plan; the suggested modifications have yet to be approved by the respective Governments. It was decided, among other things, to establish a permanent central post where a check will be kept by nightly observations on the stability of wave-lengths from the technical point of view. The Commission which deals with social and cultural matters has been augmented, and the following broadcasters have been elected active members of the Union:—Polskie Radjo (Poland), Radiogenossenschaft Basel (Switzerland), and Nederlandsche Draadlooze Omroep, the Dutch organisation which will shortly work the Huizen station. Extra-European associate members have been elected as follows:—National Broadcasting Co. (U.S.A.), Nihon Hoso Kyokai (Nagoya, Japan), Indian Broadcasting, Ltd., Amalgamated Wireless (Australasia), Ltd., Cuban Telephone Co., the Peruvian Broadcasting Organisation, and General Broadcasters, Ltd. (Australia). The European broadcasting organisations which are members of the Union now direct 113 transmitting stations serving approximately 7,000,000 receiving sets.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Aberdare.—June 2nd. Electricity Department. E.h.p. overhead and underground main and branch transmission lines. (May 13th.)

Armagh.—June 7th. Urban District Council. Heavy oil engine generating plant, underground and overhead mains. (May 13th.)

A.c. switchboard and overhead travelling crane. (May 20th.)

Australia.—MELBOURNE.—July 5th. State Electricity Commission. One 15,000-kW steam turbo-generator and accessories. (B.X. 3369.)*

July 4th. 66,000-V and 22,000-V insulators for the Yallourn brown coal scheme. (May 6th.)

June 7th. Switchboard cable. (B.X. 3532.)*

June 28th. Postmaster-General's Department. Jacks, switchboard instruments, &c. (B.X. 3474.)*

August 15th. One 55-ton 3-motor-type electrically-operated overhead travelling crane. (A.X. 4727.)*

SYDNEY.—June 20th. Municipal Council. Turbo-alternators for Bunnerong power station. (B.X. 3443.)*

July 18th. Boiler-house equipment for the Bunnerong power station. (B.X. 3531.)*

Basingstoke.—June 7th. Corporation. Electrical installations at the Council's housing estate (approx. 1,015 wiring points). (May 13th.)

Castleford.—May 31st. Urban District Council. Electrical plant, switchgear, wiring, &c., public baths. D. Firth, engineer.

Chile.—SANTIAGO.—July 18th. Chilean State Railways. Materials for electric lighting and power (Group 30). Materials for electric lighting of locomotives and coaches (Group 32). August 22nd. Signalling, telegraph and telephone supplies (Group 36). (C.X. 2271.)*

Grimsby.—June 4th. Electricity Department. Sub-station equipment. (May 13th.)

Hull.—June 16th. Electricity Department. Steel coal bunker and conveyor housing. (May 20th.)

Switchgear extensions. (See this issue.)

Ilford.—June 1st. Electricity Department. E.h.p. and l.p. paper-insulated cables. (May 20th.)

India.—June 14th. India Stores Department, Simla. Generating sets for Fyzabad power station. (B.X. 3486.)*

London.—H.M. OFFICE OF WORKS.—June 3rd. 5-ton gantry crane. (May 20th.)

HAMMERSMITH.—June 1st. Electricity Department. Cables, transformers, h.p. switchgear and ironclad feeder switchgear. (May 20th.)

Manchester.—May 30th. Electricity Department. L.p. valves for circulating water system, two electrically-driven and one steam-driven boiler feed pumps. (May 13th.)

June 13th. Seven 250-kVA static transformers. Mr. H. C. Lamb, chief engineer and manager, Town Hall, Manchester.

June 1st. Education Committee. Electric lighting installation at Levenshulme High School for Girls. Specification, &c., from Education Offices, Deansgate.

Marlborough. — Electricity Department. Additional underground feeder and overhead feeder. (See this issue.)

New Zealand.—AUCKLAND.—July 4th. Auckland Electric Power Board. Switchgear. (B.X. 3471.)*

WELLINGTON.—August 9th. Public Works Department. 1,500 suspension insulator strings and 470 strain insulator strings. (B.X. 3533.)*

Oldham.—June 11th. Electricity Department. Water-cooling towers, foundations, tanks, and circulating water pipes. (See this issue.)

Portsmouth. — Electricity Department. Transformers. (See this issue.)

Pudsey.—June 14th. Electric lighting installation at the School of Art. Specifications from Education Department, County Hall, Wakefield.

Scarborough.—June 3rd. Corporation. Installation of electrical pumping plant in duplicate for the new Irton water scheme No. 2. Specifications (£5) from Dr. H. Lapworth, engineer, 25, Victoria Street, S.W.

Sheffield.—June 11th. Tramways and Motors Committee. Supply and erection of weighbridge. Mr. A. R. Fearnley, general manager, Division Street, Sheffield.

South Africa.—Cape Town.—June 30th. South African Railways and Harbours Board. Gasfilled and vacuum lamps for 12 months. (B.X. 3518.)* Telegraph material. (B.X. 3519.)*

Elliott (C.P.).—June 15th. Municipal Council. Electric lighting plant, including engines and dynamos, steel poles, copper wire, insulators, switchboard meters, house-service fuses and street-lighting brackets and suspension fittings.

Edenburg (O.F.S.).—June 21st. Municipal Council. Electric lighting plant, including engines, dynamos, steel poles, &c.—*S.A. Mining and Engineering Journal.*

Switzerland.—Berne.—June 4th. Swiss Federal Railway authorities. Three 3,000-kVA, 60,000/15,000-V oil transformers for outdoor use, &c., for the new transformer station at Gruze. Particulars for 5 fr. from the Abtheilung für Elektrifizerung C.B.B. Dienstgebaude, 43, Mittelstrasse, Berne.

Tynemouth.—June 11th. Electricity Department. One voltage regulating transformer. (May 13th.)

Whitley.—Electricity Department. One 1,000-kW turbo-alternator, with condenser, pumps, air filter, &c.; one 200-kW semi-Diesel or heavy-oil engine alternator. (May 6th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Belgium.—Brussels.—The municipal authorities last week opened tenders for two 6,000-kW turbo-alternator sets and a 1,500-h.p. set for the Brussels municipal electric power station. Five tenders were received, the quotations ranging from £30,245 to £45,370, the lowest being that of the Belgian branch of the Brown-Boveri Co.

Bexhill.—Electricity Committee. Recommended:—
1,000 yd. cable (£346).—Enfield Cable Works, Ltd.

Glasgow.—Lighting Committee. Accepted:—
Electrical fittings and accessories.—Wm. Brown & Co.; Wm. M'Geoch & Co., Ltd.; British Electrical Mfg. Co.; Chalmers & Mitchell; Stella Conduit Co., Ltd.; John T. Cartwright; Bayliss, March and Newey, Ltd.; Lighting Trades, Ltd.; Electric Conduits, Ltd.

Government Contracts.—The following contracts were placed by various Government Departments during April, 1927:—

Admiralty Contract and Purchase Department.
300-kVA alternators.—British Thomson-Houston Co., Ltd.
Motor alternators.—Small Electric Motors, Ltd.
W/T boards.—General Electric Co., Ltd.; Whipp and Bourne, Ltd.
Distribution boxes.—Hawkers, Ltd.; E. Holme & Co., Ltd.; Basebe, Sadler & Co., Ltd.; Engineering and Lighting Equipment Co., Ltd.; Pinnacle Switchgear, Ltd.; Telford, Grier & Mackay, Ltd.; Whipp and Bourne, Ltd.
W/T condensers.—Telegraph Condenser Co., Ltd.; Dubilier Condenser Co. (1925), Ltd.
Magazine lighting fittings.—Oliver Pell Control, Ltd.
Electric light installation.—Read & Partners, Ltd.
W/T panels.—Radio Communication Co., Ltd.
E.h.p. transmission line.—G. E. Taylor & Co., Ltd.
W/T valves.—Mullard Radio Valve Co., Ltd.

War Office.
Batteries and cells.—Siemens Bros. & Co., Ltd.; General Electric Co., Ltd.; Edison Swan Electric Co., Ltd.

Air Ministry.
Magnetic adaptors.—H. W. Sullivan, Ltd.
Direction finder land station.—Marconi's W/T Co., Ltd.
Magnetos and spares.—Simms Motor Units, Ltd.
Stripping magnetos.—British Thomson-Houston Co., Ltd.
Transmitters.—Gambrell Bros., Ltd.

Post Office.
Telephone apparatus.—Automatic Telephone Mfg. Co., Ltd.; Peel-Conner Telephone Works; Siemens Bros. and Co., Ltd.; Telephone Mfg. Co., Ltd.
Testing, protective, and miscellaneous apparatus.—Chamberlain & Hookham, Ltd.; Siemens Bros. & Co., Ltd.
Cable (various).—British Insulated Cables, Ltd.; Callender's Cable & Construction Co., Ltd.; Enfield Cable Works, Ltd.; General Electric Co., Ltd.; W. T. Glover & Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones & Cables, Ltd.
Loading coils.—Siemens Bros. & Co., Ltd.
Electric lamps.—Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.
Tungar rectifiers.—British Thomson-Houston Co., Ltd.
Copper wire.—E. & E. Kaye, Ltd.
Switchboard wire.—Connollys (Blackley), Ltd.
Manufacture, supply, drawing in and jointing cable.—London-Uxbridge; Callender's Cable & Construction Co., Ltd.
Lifts, Temple Bar Telephone Exchange.—W. Wadsworth and Sons, Ltd.
Radio station power plant, Humber (Lincs.).—Austin Lighting Co., Ltd.
Telephone exchange equipment.—Doncaster: General Electric Co., Ltd. Headingley (Leeds): Automatic Telephone Mfg. Co., Ltd. Walton (Liverpool): Standard Telephones & Cables, Ltd. Harrods, Ltd. (H.O.); Harrods, Ltd. (Estate Office); (London, S.W.); Cumberland County Council; J. & E. Hall, Ltd. (Dartford); Union Coal Storage Co., Ltd. (Liverpool); Relay Automatic Telephone Co., Ltd.

Crown Agents for the Colonies.
Armatures.—Railway Signal Co., Ltd.
Cable.—W. T. Glover & Co., Ltd.
Electric welding sets.—Premier Electric Welding Co., Ltd.
Lamps.—General Electric Co., Ltd.
Motors.—Laurence Scott & Co., Ltd.
Switchgear.—British Thomson-Houston Co., Ltd.
Telephone materials.—Siemens Bros. & Co., Ltd.; Ericsson Telephones, Ltd.; W. T. Henley's Telegraph Works Co., Ltd.
Train lighting spares.—J. Stone & Co., Ltd.
Transformers.—British Electric Transformer Co., Ltd.

London.—London County Council.—Education Committee. Electric lighting installation, Burghley Road schools, St. Pancras:—

Pinching & Walton. (Recommended.) ...	**£1,138**
A. Hawkins & Sons	1,189
A. Dean & Co., Ltd.	1,213
H. J. Cash & Co., Ltd.	1,249
Berkeley Electrical Engineering Co.	1,493
Commercial Telephone & Electrical Co., Ltd.	1,662

Electric wiring and fittings at Sudbourne Road school, Brixton:—

Fordham Electrical Engineering Co., Ltd. (Accepted.)	**£298**
Bailey & Incledon, Ltd.	340
E. Dyne	347
Smith & Hammond, Ltd.	360
A. Higginbotham & Sons	375
Alpha Mfg. & Electrical Co., Ltd.	375
Anderson, Angell & Co.	397
A. Hawkins & Sons	398
E. Wender	403
Emerson Bros.	403
R. Hunt & Co., Ltd.	407
J. Briggs, Electrical Contractors, Ltd.	444
South London Electric Supply Corp., Ltd. ...	470
Smethurst & Co. (London), Ltd.	470
South London Electrical Co.	478
Stegman & Co.	530
A. Sparrow & Co.	579
J. Vigon	593
Tyche, Ltd.	775

Electric lighting at Stonehouse Street school, Clapham:—

Holder & Snider. (Recommended.)	**£379**
Alpha Mfg. and Electrical Co., Ltd.	440
A. Higginbotham & Sons	449
J. Briggs, Electrical Contractors, Ltd.	467
E. Wender	484
A. Hawkins & Sons	498
Bailey & Incledon, Ltd.	499
H. Shaw	520
Smith & Hammond, Ltd.	535
Stegman & Co.	577
Ridout & Ratcliff, Ltd.	630
Burgess & Garfield	650

Wiring and fittings at Everington Street school, Fulham:—

Holder & Snider. (Recommended.)	**£439**
W. & G. Firmin	500
Alpha Mfg. and Electrical Co., Ltd.	500
Bailey & Incledon, Ltd.	507
Anderson, Angell & Co.	517
A. Higginbotham & Sons	520
A. Hawkins & Sons	539
E. Wender	540
H. Shaw	570
S. Hellyar, Ltd.	650
Smith & Hammond, Ltd.	689
J. Briggs, Electrical Contractors, Ltd.	695
Ridout & Ratcliff, Ltd.	720
R. Hunt & Co., Ltd.	723
H. G. Gunner	799
Stegman & Co.	817

Correction.—By a printer's error, the tender of Messrs. Rashleigh Phipps recommended for acceptance by the Westminster Housing Committee, was incorrectly stated in our last issue. The tender was for an electric lighting installation at Regency Street Dwellings. Messrs. Bailey & Incledon, Ltd., received the contract placed by the L.C.C. Education Committee in connection with the Drayton Park School, as stated.

Highways Committee. Accepted:—
Conductor rails (£5,846).—Frodingham Iron and Steel Co., Ltd.
Track rails and fastenings (£31,837).—Dorman, Long and Co., Ltd.

The London County Council has placed a 12-months' contract for electric incandescent lamps with Siemens & English Lamp Co., Ltd.

HACKNEY.—Electricity Committee. Recommended:—
One 10,000-kW turbo-alternator (£25,300).—C. A. Parsons and Co., Ltd.
Converting plant and booster (£15,643).—Bruce Peebles and Co., Ltd.
Switchgear (£13,413).—Johnson & Phillips, Ltd.; (£6,394), A. Reyrolle & Co., Ltd.

STEPNEY.—Electricity Supply Committee.
Meters, &c., for 12 months:—
5 to 20 amps.—Measurement, Ltd.
Prepayment meters and 50- to 100-amp. meters.—Ferranti, Ltd.
Combined meters and demand indicators.—Aron Electricity Meter, Ltd.
Time switches.—Venner Time Switches, Ltd.
Conduits, troughs and covers.—Albion Clay Co., Ltd.

Hamilton.—Town Council. Recommended:—
Electric lighting work in connection with the re-housing scheme at Low Waters.—W. Y. M'Adam.

Kiveton Park.—Rural District Council. The Eastern Counties Electrical Construction Co., of Ipswich, has received a contract from the Kiveton Park Rural District Council, near Sheffield, for an extensive electrical development scheme in the Harthill district.—*East Anglian Daily Times.*

Tynemouth.—Electricity Committee. Accepted:—
Cable (£308).—Connolly's (Blackley), Ltd.; (£92), Hogan and Wardrop.

Forthcoming Events.

Institution of Production Engineers.—Friday, May 27th. 83, Pall Mall, S.W. 7.30 p.m. "Rate Fixing." Mr. J. Ronald.

Physical Society.—Friday, May 27th. Imperial College of Science, South Kensington, S.W. 5 p.m. Ordinary meeting.

Incorporated Municipal Electrical Association.—May 30th to June 4th. Buxton. Annual Convention.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the name and address of makers of the following:—

McDONALD hair waving machine.
Perkins' YANKEE switch.
ELECTRA curling iron.

Notes.

London's Tramways.

In a letter to the *Morning Post*, Sir George H. Hume, M.P., refutes some of the allegations that have been made with regard to the financial condition of the electric tramways of the London County Council. Referring to the statement that the loss on their working for the year ended March 31st, 1927, has been £302,114, he points out that that sum, in fact, represents the deficiency for the period mentioned after payment of interest on debt (£270,000) and repayment of debt (£234,500), a very different thing to a loss. "It would be well," he says, "for the public to realise that with all the deficiencies that have had to be faced, it only amounts to this: that the ratepayers will have had to pay, up to date, a little over a million pounds for a property which is maintained at concert pitch, and represents a capital expenditure of something like sixteen million pounds, a large part having been incurred at pre-war values.

"The actual loss during the general strike, and the additional cost of fuel as a result of the long stoppage in the coal industry, was £226,000, a loss which was unavoidable and abnormal. Allowing for this sum, the deficiency figure would be reduced to about £76,000, and, even then, it is fair to say that much of this resulting deficiency was due to the general disturbance of trade and the consequent depression of revenue."

The Chiswick Power Station.

The London and Home Counties Joint Electricity Authority has issued a 20-page booklet, containing a coloured map and reproduced photographs of a scale model of the buildings, dealing briefly with various aspects of the proposed generating station at Chiswick to serve the whole of the western portion of the J.E.A.'s area. The 44.5-acre site is on the River Thames, and served by the Southern Railway; it is proposed to construct a tidal dock and a drive and promenade along the river frontage; the station's ultimate capacity will be 325,000 kW, and its maximum sustained load 250,000 kW. Three boiler houses will contain 30 boilers, and the chimneys will be invisible, as they will not extend above the parapet of the walls, while poplar trees will be planted to screen the coal storage site. The J.E.A.'s No. 2 Parliamentary Bill is now being considered by a committee of the House of Commons, and Mr. J. H. Rider (consulting engineer to the Joint Authority), in evidence, said that the Chiswick site was that which he and the other engineers concerned had recommended to the Commissioners in 1921. In the Joint Authority's district the demand in 1919-20 was 308,822 kW, and in 1925-26 it was 577,317 kW. He now estimated that the demand in 1930-31 would be 878,590 kW, and 1,179,920 kW in 1935-36. Excluding railway plant, in the Joint Authority's district there were 62 stations, with a gross capacity of 1,327,784 kW of installed plant. The scheme put forward in his report to the Authority in 1926 provided for the retention of three primary and 20 secondary power stations, having a total plant capacity of about 1,245,000 kW, the three primary stations being those at Deptford, Brimsdown, and Barking. An installed plant capacity of over 1,500,000 kW would be needed to meet the estimated demand in 1935-36, with proper provision for stand-by, but it was likely that that estimated demand would be exceeded. The first section's installed capacity of 125,000 kW would serve a load up to 75,000 kW, leaving 50,000 kW for reserve. The ultimate capacity of 325,000 kW would consist of six 50,000-kW and one 25,000-kW sets; each boiler would have a normal evaporative capacity of 100,000 lb. of water per hour, and the ashes would be conveyed through water and dropped into trucks and carried to barges in the dock. Coal would come by railway; in addition to the service hoppers sufficient only for a day or two, there would be three silos, each having a capacity of 9,000 tons, and a reserve silo with a capacity of 100,000 tons; its top would be some 15 ft. below ground level, and this large stock of coal would be under water. When the station was going at full capacity it would require something like 16.8 million gallons of water per hour, which gave some idea of the absolute necessity for finding a site where ample condensing water could be obtained.

Mr. Rider said that on the basis of a 40 per cent. load factor and coal at 20s. per ton, the total cost per kWh sent out from the first section of 125,000 kW would be 0.4315d. When the station was completed the total cost would be 0.366d. per kWh. The total capital cost of the station, when completed, would be £13.9 per kW, or a total of just over 4¼ millions sterling, whilst the capital cost of the first section would be £14.9 per kW. There was no doubt that the station at Chiswick, if passed, would become a "selected station" under the scheme of the Central Electricity Board. Referring to the opposition of the London Power Co., Mr. Rider said the fact that that company was applying to the Commissioners for permission to erect a large power station at Battersea would not affect the present proposal in any way, because he believed there would be need for two large stations of this character by the time they were both erected.

Industrial Electric Vehicles.

The Ministry of Transport has recently issued for the first time a return of the actual number of motor vehicles registered in this country at the end of September, 1926. A section of the return is devoted to electric goods-carrying vehicles, from which we learn that at the date mentioned there were 603 such vehicles in use in Great Britain, 552 being in England, 26 in Wales, and 25 in Scotland. Vehicles of an unladen weight up to 25 cwt. head the list with 156, those between 3 and 4 tons following with 150; 105 are between 2 and 3 tons, 101 between 4 and 5 tons, 75 between 25 cwt. and 2 tons, seven between 5 and 6 tons, six over 4 tons, but exact weight not stated, and three over 6 tons. Trailers are used in conjunction with 23 of the 603 machines.

E.P.E.A. Visit.

At the invitation of Mr. C. M. Shaw, M.I.E.E., chief engineer and general manager of the Worcester electricity undertaking, over one hundred members of the Birmingham and North-West Midlands Sections of the Electrical Power Engineers' Association paid a visit to Worcester on May 14th, when a motor tour was made of the extended area of supply. Some very interesting examples of overhead transmission and distribution schemes were inspected, and also the hydro-electric power station. In the evening the party inspected the plant at the city power station. At a meeting which followed Mr. Shaw gave a historical survey of the undertaking's development.

Electrical Association for Women.

On May 16th members of the Birmingham and Midlands Branch of the above Association attended a lecture-recital on the "Duo-Art Pianola Piano," at the invitation of Messrs. W. H. Priestley & Sons, Ltd., at Queen's College, Birmingham. The lecture took the form of an explanation of the uses of the "Duo-Art Pianola Piano," and was followed by a recital.

Electrification of Aberdeen Sawmills.

Messrs. W. Fiddes & Son, Ltd., Aberdeen, whose factory is equipped with the latest sawing and box- and barrel-making machinery, have recently adopted individual motor drives for each machine; the round logs are placed on a continuously moving chain, by which they are automatically fed through circular saws which square the logs on four sides. The squared logs then automatically travel forward to re-saws, which cut them rapidly into boarding. The slabs which fall from the round logs are simultaneously carried to edgers, where they are sawn to breadths at a speed of over 200 lineal feet per minute. Thereafter they are rapidly sawn into thin boards by circular saws, some of which run at speeds as high as 2,900 revolutions per minute. Conveyors carry the timber from one stage to another.

Each machine, or bench, is provided with suction tubes which branch off from a large overhead duct, through which all sawdust from the saws is conveyed direct to the furnaces, where, consumed as fuel, it generates steam for driving the electric generating plant, no coal being used. Thus, the factory, which is quite free from dust, is run with the utmost economy, efficiency and cleanliness, with a total absence of sawdust accumulation about the benches, or the floors or pits adjacent to the saws. All the motors are pipe-ventilated, each pipe being connected to either of two main air ducts. The lighting installation consists of some 30 "Geco" dispersive type vitreous enamelled steel reflectors, used in conjunction with 300-watt "White Osram" bowl sprayed gasfilled lamps; uniform illumination of high intensity, free from glare or dazzle, prevails everywhere in the factory. The lighting scheme was designed by the Illuminating Engineering Department of the General Electric Co., Ltd., which, in determining the height spacing ratio, had to take into consideration the necessity of rendering the saws absolutely free from shadow; this was deemed to be of the utmost importance from the point of view of safety.

The Earthing of Portable Domestic Appliances.

We are gratified to see that the article upon this subject by Mr. R. H. Rawll in our issue of February 11th has attracted attention in Belgium. Our Brussels contemporary, *Eclairage et Force Motrice*, published the greater part of the article (in French) in its May issue, but, apparently by an oversight, omitted to mention its source.

Local Societies.

On May 20th members of the Birmingham Electric Club visited the Preston works of the English Electric Co., Ltd., and the Siemens and English Electric Lamp Co., Ltd., at Preston, where they were entertained and welcomed by Mr. W. Marshall and Mr. W. H. Le Marechal, the managers of the two concerns, respectively.

Irish Free State Electricity Supply.

The Free State Government's Electricity Supply Bill last week passed through the Senate of the Free State Parliament, and has now received the Royal Assent. In the closing stages in the Senate, a Government amendment was adopted to relieve the Shannon works from liability for rates. The Minister for Industry and Commerce, Mr. McGilligan, said that the undertaking would be in the position of a municipal undertaking. Senator Kenny protested against the non-inclusion of a fair wages clause.

At a meeting of the Irish Centre of the Institution of Electrical Engineers, the question of rural distribution of electricity under the Shannon scheme was discussed. Mr. C. P. Coote Cummings expressed the view that price was the factor that would determine whether the farmer was to become a customer of the Board. If the scheme did not become a reasonable success it would be a definite set-back to the country. He did not think it would be a great success in a short number of years. It was a great pity that it should be handicapped at the outset by the antagonism of a very large proportion of the electrical industry of the Free State. Dr. Lothman, Free State Government expert, urged the necessity for having the co-operation of electrical engineers in educating the farmer in the uses of electricity. He mentioned the difficulties experienced in this respect with the Canadian farmers, who had now, however, been convinced.

A meeting of the Executive branch of the Surveyors' Institution has completed arrangements for a visit of the Institution to the Shannon works early in June.

Tramways and Light Railways Association.

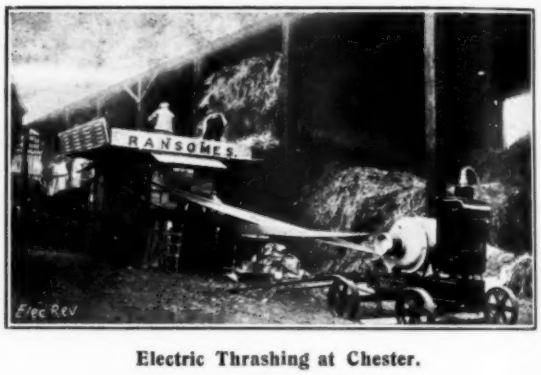
The annual congress of the Association will be held on June 30th and July 1st, at Bath. The headquarters will be at the Grand Pump Room Hotel. The following papers will be read on Thursday, June 30th: "Some Aspects of Local Passenger Traffic," by Mr. W. E. Hardy, and on Friday, July 1st, "Modern Tramway Equipment," by Mr. A. V. Mason.

Appointments Vacant.

Temporary clerk of works (£5) for the Hazel Grove and Bramhall Urban District Council Electricity Department. Assistant engineer in the Mains Department, for the Portsmouth Corporation. Mains assistant for the Wolverhampton Corporation Electricity Department. Probationary assistant telegraph engineer for the Government of Nigeria. Visiting teacher of carpentry and joinery, and visiting instructors of acetylene welding, electrical installation, engineering workshop practice and engineering economics, for the L.C.C. School of Engineering and Navigation. (See our advertisement pages to-day.)

An Electric Thrashing Demonstration.

A successful demonstration was recently carried out at Messrs. S. & J. M. Podmores's Deeside Farm, Chester, where a 7-acre oatcrop was placed at the joint disposal of the Chester Corporation Electricity Department and Messrs. Ransomes, Sims & Jefferies, Ltd., to demonstrate the utility of modern electric thrashing machinery. With a 25-h.p., 3-phase, 400-V portable Ransomes motor, driving a medium-finishing thrashing machine, fitted with a drum 4 ft. 6 in. wide and 22 in. in diameter, and a Ruston & Hornsby straw-pressing machine driven by belt from the main shaft of the thrashing machine, the crop was thrashed in 8 hours 38 minutes; 199 cwt. of grain and 282 bales of straw, weighing 191 cwt., were produced. The consumption of electricity amounted to 90.6 kWh, or .45 kWh per cwt. of grain, or 12.93 kWh per acre. The charge for electricity for power



Electric Thrashing at Chester.

purposes is 1¼d. per kWh, making the total cost for power 13s. 3d., .79d. per cwt. of grain, or 22.65d. per acre. During the first hour no attempt was made to work the thrashing machine to its full capacity. The machine was fed by several different people who wished to have personal experience of feeding the machine and testing its capacity. A large number of farmers witnessed the demonstration, and without exception the opinion was expressed that electric power offered great advantages over other methods of driving.

A Cheap American Toaster Banned.

The *Electragist* for May contains the following note:—The ordinance against the sale of unapproved electrical appliances in Portland, Oregon, was recently invoked in causing the arrest of the manager of the Woolworth store there who was offering a toaster for 15 cents. Deputy Electrical Inspector Caine was the complainant, and the court imposed a fine of $25 for the offence with an order to cease selling these appliances at once. He further ruled that all who had purchased the contrivances might recover their money upon application at the store, and that the failure of the store managemnt to return it would result in further fines. Caine said that the toaster was the most dangerous life and fire hazard he had ever seen in Portland.

An Electrical Relay.

A new electrical relay, invented by Mr. D. D. Knowles, research engineer of the Westinghouse Electric and Manufacturing Company, is known as the grid-glow relay, and resembles a radio vacuum tube in appearance. When properly connected, a billionth of a watt is sufficient to control the flow of a current which, in opening or closing another relay, can control currents as high as twenty-five amperes. Though exhausted of air, the tube contains neon, argon, or some similar gas which is chemically inert; the parts within are an anode, a cathode and a grid, but there is no filament. When the anode and cathode are connected to the two terminals of a circuit of about 440 volts no current flows, because an electrical charge is built up on the grid which blocks it, so long as the grid is insulated; but if the grid be earthed, the current will flow and operate any device connected in the circuit. In demonstrations to show how jewelry may be protected, a watch was laid on a plush cover under which was a piece of tinfoil connected to the grid of the relay tube; as soon as the hand was brought near the watch (and the tinfoil) the grid being discharged, the 440-volt current flowed through the tube, and operated any device in the circuit.

National Illumination Committee of Great Britain.

We have received a copy of the report for the year 1926, which was presented at the special annual meeting of the Committee on February 1st, 1927. The chairman (Lt.-Col. Kenelm Edgcumbe) states that the Sectional Committee on Illumination, of which members of the above Committee form the nucleus, set up by the British Engineering Standards Association, has made very satisfactory progress, and five specifications dealing with important illumination materials or problems have been issued, or are on the point of completion. The Committee has supported a proposal to standardise miners' lamp bulbs, which has been considered favourably by the British Engineering Standards Association.

The proposed plenary session of the International Commission on Illumination has been postponed provisionally until 1928. In the meantime meetings of the executive and technical committees are being arranged in Rome for September, 1927. The International Commission now includes Belgium, France, Germany, Great Britain, Italy, Japan, Switzerland, and the United States of America.

The progress of the work of the Illumination Section of the British Engineering Standards Association during the past year is summarised by Mr. Percy Good, who states that the Sub-Committee on Illumination Glassware has practically completed its first specification for an illumination fitting of translucent glassware for interior lighting. The Committee has had the benefit of the assistance of five or six of the leading glassmakers during the past six months.

The Sub-Committee on Industrial Reflector Fittings, as was reported last year, completed the Specification No. 232, "Industrial Reflector Fittings for Direct General Lighting, No. 1 (Dispersive Type)." Since the issue of this specification the Committee has agreed to alter the table to show the gauges of metal instead of the thicknesses of steel, and the note to Clause 6 has also been altered to read: "This figure is *based upon* and complies with the recommendation of 20 degs. from the horizontal for light sources at distances of not less than six feet, contained in the second report of the Departmental Committee on Lighting in Factories and Workshops, 1921."

The Sub-Committee on Street Lighting has completed its draft specification, which was presented for discussion at the Institution of Electrical Engineers and the Illuminating Engineering Society in March.

The session at Bellagio, mentioned in our last issue, is solely for the Executive Committee and sub-committees, preparatory to next year's plenary session; it will be under the presidency of Dr. E. P. Hyde, and the arrangements are being made by the Italian National Committee on Illumination.

Tale of a Rat.

The Times reports that a failure of the electricity supply at Brentford on May 18th was found to have been caused by the gnawing by a rat of one of the main cables of supply. The rat was killed. This is the second time in 12 days that the Brentford electricity supply has been cut off in this manner.

Institution Notes.

Institution of Electrical Engineers.

NORTH-WESTERN AND MERSEY AND NORTH WALES (LIVERPOOL) CENTRES.—On May 14th, at Chester, a party of 136 members, ladies, friends and guests spent the morning viewing the works of Brookhirst Switchgear, Ltd., whilst the ladies of the party toured Chester. The luncheon at the Grosvenor Hotel was a happy gathering, and in the afternoon the Chester Corporation's hydro-electric station was visited. There followed a trip up the River Dee in motor launches to Iron Bridge, where tea was served, the party returning through the gardens of Eaton Hall (by permission of the Duke of Westminster) to Eccleston Ferry, and there joining the motor launches for Chester. The meeting was a decided success and was very much appreciated and enjoyed.

WESTERN CENTRE.—The week-end summer meeting of the Western Centre took place from May 20th to 23rd at Plymouth, where the annual meeting was held on the Friday evening. On the Saturday morning a motor coach trip was arranged to Bodmin, where the "beam" radio-telegraph station of the Post Office was inspected; after luncheon the drive was continued, tea being served at Downderry and dinner at Plymouth. On the Sunday morning facilities were provided for viewing the historical parts of Plymouth; during the afternoon there was another drive, and Mr. W. G. Heath (chairman of the Centre) entertained the party to tea at his house on Crown Hill. On the Monday morning the Royal Naval Engineering College Laboratories at Keyham were visited, the meeting terminating at noon.

There was an attendance of 80 members, with their wives and friends. The chairman referred to the fact that since the last meeting was held in Plymouth four years ago the organisation had grown considerably in membership, and was in a flourishing condition. Notwithstanding the scattered area which comprised the Western Centre, the attendance had been well up to the average, and compared most favourably with those of other Centres. It was reported that the total membership amounted to 632, made up of 88 members, 247 associate members, 7 associates, 114 graduates, and 176 students. The ballot for filling vacancies on the Committee resulted in the election of the following:—Messrs. R. D. Archibald (Devonport), A. F. Coates (Bristol), L. A. Hards (Cornwall), J. W. Spark (Bath), and T. J. Plevin (Cardiff).

WIRELESS SECTION.—The following gentlemen have been nominated by the Wireless Section Committee to serve from October 1st, 1927:—*Chairman*: Lieut.-Col. A. G. Lee; *ordinary members*: Mr. J. Hollingworth, Mr. E. B. Moullin, Mr. G. H. Nash, and Mr. C. E. Rickard. The following will continue to serve as members of the Committee: The president, I.E.E., the chairman of the Papers Committee, I.E.E., a nominee of the Council, I.E.E., a nominee of the General Purposes Committee, I.E.E., Major B. Binyon, Mr. P. R. Coursey, Capt. P. P. Eckersley, Dr. R. V. Hansford, Prof. E. Mallett, Mr. S. R. Mullard, Mr. E. H. Shaughnessy, and Mr. G. Shearing, together with one representative each to be nominated by the Admiralty, Air Ministry, General Post Office, and the War Office.

Institute of Transport.

The Council has elected the undernamed to take office on October 1st, 1927:—*President*: Mr. Roger T. Smith, B.Sc., M.I.E.E.; *Hon. Treasurer*: Sir Henry P. Maybury, C.B., K.C.M.G.

American Röntgen Ray Society.

The twenty-eighth annual meeting of the American Röntgen Ray Society will be held in Montreal on September 20th to 23rd, 1927, under the presidency of Dr. A. Howard Pirie, of Montreal. This is the first occasion on which the Society has met outside the United States; and, to acknowledge the honour paid to a British radiologist by his election to the presidency of the Society, a party of radiologists from this country will take part in the proceedings. Dr. G. W. C. Kaye has been invited by the Society to give the Caldwell lecture.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. R. E. KIMENS, Commercial Secretary at Warsaw, will be in attendance at the Department of Overseas Trade, 35, Old Queen Street, S.W.1, from June 1st to 4th inclusive. Applications for interviews by representatives of United Kingdom firms interested in Polish trade should be made to the Comptroller-General of the Department.

The Islington Borough Council has confirmed the appointment of Mr. ALEXANDER P. MACALISTER as borough electrical engineer in succession to the late Mr. Albert Gay, at a salary of £1,050, rising to £1,250. Mr. MacAlister was educated privately and at the City of London School, leaving there in 1894 to serve an apprenticeship at the Engineering and Locomotive Works of the London and South-Western Railway Co., at Nine Elms. After passing through all the departments, Mr. MacAlister went, in 1899, to the Croydon Electricity Department as draughtsman, and was in succession charge engineer, mains engineer, and technical assistant in charge of extension work. In 1903 he became mains superintendent to the Battersea Electricity Department, and was later chief assistant engineer, acting as chief engineer pending the appointment of Mr. Bond. He went to Islington in 1907 as chief assistant and deputy electrical engineer, and during his service there has been largely responsible for the extension and other work in connection with the modernising of one of the original London stations.

Messrs. Merz & McLellan announce the introduction of members of their engineering staff into partnership as follows: Mr. H. H. BAKER with Mr. C. H. MERZ and Mr. W. MCLELLAN in the firm of Merz & McLellan; Mr. F. LYDALL with Mr. C. H. MERZ in the firm of Merz & Partners; and Messrs. R. NELSON and A. H. HUMAN with Mr. W. MCLELLAN in the firm of McLellan & Partners.

Mr. BERNARD SLEATH has resigned the position that he has held with Messrs. Chamberlain & Hookham, Ltd., for the past 16 years, and has joined the staff of Venner Time Switches, Ltd., in whose interests he will visit South Wales, the Midlands, the West of England, and other parts.

The *Manchester Guardian* says that Mr. C. W. LOVERIDGE has resigned his post on the engineering staff of the Manchester Ship Canal Company to take up an appointment at the headquarters in London of the Central Electricity Board.

According to the *Review of the River Plate*, Mr. JAMES DALRYMPLE, late general manager of the Glasgow Corporation Tramways, who has been on a special mission with reference to street traffic in Sao Paulo and Rio de Janeiro, was to leave for England on the *Arlanza* on May 15th.

Mr. SINGER, whose new appointment was mentioned here last week, asks us to state that his initials are M. W.

Obituary.—Mr. W. E. Hardy.—The death is reported, following an operation, of Mr. William Eversley Hardy, managing director of the Bath Tramways Co. Mr. Hardy had been with the company for 24 years, having previously served with the City of London Electric Lighting Co., Ltd.

Mr. J. B. Malpass.—We regret to note the following announcement in *The Times* "Deaths" column:—"On May 17th, 1927, in Calcutta, of pneumonia, John Bernard Malpass (late Capt. R.E.T.), of Metropolitan-Vickers, Ltd., only son of Capt. A. Malpass (Indian Army, retd.), in his 43rd year."

Wills.—Sir J. S. Harmood-Banner, Bt., left £449,279 gross and £232,451 net personalty.

Mr. Walter Leaf, chairman of the Central Electric Supply Co., Ltd., and the St. James' and Pall Mall Electric Light Co., Ltd., left £124,186 (net personalty £117,640).

The late Mr. A. R. Hardie, a director of the Eastern Telegraph Co., Ltd., left £13,027 gross, and £12,044 net.

The late Mr. J. C. Phillips, of C. D. Phillips, Ltd., Newport, left £22,793 gross and £22,385 net personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Catton & Coates, Ltd.—Private company. Registered May 16th. Capital, £2,000 in £1 shares. To acquire the business of manufacturers' agents carried on by E. F. Catton and W. Coates at 13, Chapel Road, Southampton, as "Catton and Coates," to manufacture heating and cooking appliances, and to carry on the business of electricians and mechanical and electrical engineers, &c. The permanent directors are:—W. A. Hammock, 135, Above Bar Street, Southampton, insurance manager (chairman); L. Phillips, 49a, London Road, Southampton (director of L. Phillips (Southampton), Ltd.); W. H. Stone, 23, Windsor Terrace, Southampton, hotel proprietor; E. F. Catton, 63, Violet Road, Southampton, manufacturers' agent; W. Coates, 2, Middle Street, Southampton, manufacturers' representative. Remuneration, £100 per annum divided between them. Registered office: 13, Chapel Road, Southampton.

Perring-Thoms Wireless Syndicate, Ltd.—Private company. Registered May 16th. Capital, £525 in 500 ordinary shares of £1 and 500 founders' shares of 1s. Objects:—To acquire the business of a wireless, telephone, and telegraph engineer and manufacturer of wireless apparatus, &c., lately carried on by P. Perring-Thoms at Brighton. The subscribers (each with one ordinary share) are:—G. C. Wilkinson, 148, Hatherley Gardens, East Ham, E.6, registrar; R. Backer, "Ivydene," Holyrood Drive, Westcliff-on-Sea, clerk. Solicitors: Vallance & Co., 8, Union Court, E.C.2.

W. Baron & Co. (London) Ltd.—Private company. Registered May 16th. Capital, £2,000 in £1 shares. Objects:—To carry on the business of manufacturers of articles of all kinds from vulcanised fibre, fibre, ebonite, bakelite and/or other like substances, &c. The first directors are:—S. T. Tracey, 59, Kingsway, Wembley, Middlesex (director of Domestic Supply Co., Ltd.); J. T. J. Hollom, 28, Croftdown Road, N.W.5 (director of Hillier, Hollom & Co., Ltd.). Secretary: F. C. Munt. Solicitor: C. H. Wright, 34, Clement's Lane, E.C.4. Registered office: 1-3, Red Lion Court, E.C.4.

Microfuses, Ltd.—Private company. Registered May 14th. Capital, £100 in £1 shares. Objects:—To execute an assignment by R. H. D. Barklie to the company for the purchase of patent No. 265,263, dated February 7th, 1927, granted to him for improvements in the manufacture of electric fuses, and to carry on the business of mechanical and electrical engineers, manufacturers of, and dealers in wireless and all other electrical apparatus, &c. The directors are:—C. D. Barklie, Penton Lodge, 47, Old Lodge Lane, Purley; R. H. D. Barklie, Penton Lodge, 47, Old Lodge Lane, Purley, research chemist. Qualification, 1 share. Secretary: C. D. Barklie. Solicitors: George L. Barnett and Co., Balfour House, Finsbury Pavement, E.C.2. Registered office: 3, Finsbury Square, E.C.2.

Sydney W. Bussell, Ltd.—Private company. Registered May 17th. Capital, £500 in £1 shares. Objects:—To carry on the business of electrical and general engineers and contractors, manufacturers of, and dealers in machinery, appliances, instruments, apparatus, metals, &c. The first directors are:—S. W. Bussell, 91, Hawthorne Road, Willesden Green, N.W.10, mechanical and electrical engineer; Mrs. H. M. Bussell, 91, Hawthorne Road, Willesden Green, N.W.10. Solicitors: Kennedy, Lindo & Co., 79, Coleman Street, E.C.2.

Radio Service (London), Ltd.—Private company. Registered May 17th. Capital, £1,000 in £1 shares. Objects:—To enter into a contract with Rotax (Motor Accessories) Ltd., for the purchase of the business known as The Radio Service Co., and carried on by it at 105a, Torriano Avenue, Camden Town, N.W., and to carry on the business of hirers, maintainers, and repairers of accumulators and batteries, manufacturers of, and dealers in wireless broadcasting and receiving sets, &c. The first directors are:—G. D. Le Lievre, 8, Beverstone Road, Brixton Hill, S.W.; F. W. Larner, 48, High Street, Camden Town, N.W.1; E. A. Minter, 68, Park Street, Camden Town, N.W.1. Secretary: R. B. Marler. Registered office: 105a, Torriano Avenue, Camden Town, N.W.

Leeds Sunlight and Electrical Clinic, Ltd.—Private company. Registered May 16th. Capital, £500 in £1 shares. Objects:—To carry on the business of medical and general electricians, masseurs, radiologists, &c. The first directors are:—Mrs. I. Collins, 39, The Drive, Adel, Leeds; Mrs. E. G. Blackburn, 106, Westfield Road, Leeds. Qualification, £100.

C. D. Bond & Son, Ltd.—Private company. Registered May 19th. Capital, £2,000 in £1 shares. Objects: To acquire the business of manufacturing and general engineers carried on by C. D. Bond and V. C. Bond, at 43, Johnson Street, Westminster, as "C. D. Bond & Sons," and to carry on the business of electrical, mechanical, motor, telephone, and general engineers, manufacturers of and dealers in electrical goods and accessories, &c. The permanent directors are: C. D. Bond, Runnymede, Charlton Road, Shepperton-on-Thames, engineer (director of Marpole & Bond, Ltd.); V. C. Bond, Runnymede, Charlton Road, Shepperton-on-Thames, engineer. Qualification, £50 shares. Registered office: 43, Johnson Street, Westminster, S.W.

Official Returns of Electrical Companies.

Rapinet, Ltd.—S. Sharpe, of Balfour House, Finsbury Pavement, E.C., ceased to act as receiver or manager on May 10th, 1927.

Brighton Lighting and Electrical Engineering Co., Ltd.—Particulars filed of £2,000 debentures authorised April 23rd, 1927, charged on the company's property, present and future, including uncalled capital (subject to mortgage on 10a to 10c, St. Martin's Place, Brighton, securing £1,000), the amount of the present issue being £1,250.

International Electrolytic Plant Co., Ltd.—Debenture dated April 22nd, 1927, to secure £550, charged on the company's undertaking and property, including uncalled capital. Holder: H. Rowlands, Bremesgrave Chase, Barnt Green, Worcs.

Chislehurst Electric Supply Co., Ltd.—Satisfaction in full on April 12th, 1927, of debentures dated February 23rd, 1900, and July 2nd, 1906, securing £10,000.

Lithanode Co., Ltd.—Particulars filed of £5,000 debentures authorised January 27th, 1927, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £2,900.

Nefa Co., Ltd.—Capital, £1,000 in £1 shares. Return dated January 14th, 1927. 999 shares taken up. £999 paid. Mortgages and charges, £500.

Aberayron and District Electricity Supply and Power Co., Ltd.—Capital, £3,000 in £1 shares. Return dated November 16th, 1926 (filed March 29th, 1927). All shares taken up. £2,998 considered as paid. £2 calls unpaid. Mortgages and charges, £1,400.

Stella Conduit Co., Ltd.—Capital, £20,000 in £1 shares. Return dated January 14th, 1927. All shares taken up. £20,000 considered as paid. Mortgages and charges, nil.

High Salvington Electric Supply Co., Ltd.—Capital, £1,300 in £1 shares. Return dated January 5th, 1927. 1,122 shares taken up. £722 paid. £400 considered as paid. Mortgages and charges, nil.

Interchangeable Electric Signs, Ltd.—C. H. Seaton, of 62, Brook Street, W., was appointed receiver on May 5th, 1927, under powers contained in first debenture, dated February 26th, 1926.

Gwynedd Trust, Ltd.—Capital, £10,000 in 9,500 7 per cent. cum. preference shares of £1 each and 10,000 ordinary shares of 1s. each. Return dated March 14th, 1927. 2,002 preference and 10,000 ordinary shares taken up. £2,502 paid. Mortgages and charges, nil.

International Hydro-Electric Development Syndicate, Ltd.—Capital, £10,000 in £1 shares. Return dated January 14th, 1927. 2,254 shares taken up. £2,254 paid. Mortgages and charges, nil.

Mackallen Heating Co., Ltd.—Capital, £99 in £1 shares. Return dated January 6th, 1927. All shares taken up. £99 paid. Mortgages and charges, nil.

Attaix, Ltd.—Mortgage dated May 5th, 1927, to secure £1,000, charged on 106, High Street, Southampton. Holder: S. Rogers, 4, Rotunda Terrace, Cheltenham.

Callington & District Electric Supply Co., Ltd.—Issue on April 27th, 1927, of £250 debentures, part of a series already registered.

City Notes.

Siemens Brothers & Co., Ltd.

The annual meeting was held on Tuesday last, Mr. G. Mure Ritchie presiding. In moving the adoption of the report (ELECTRICAL REVIEW, May 20th, p. 810), the chairman, after referring in detail to the balance sheet which, he said, showed that from the point of view of capital resources the company was in a stronger financial position than at any time since the shareholders acquired the undertaking nine years ago, remarked that at the beginning of 1926 he was hopeful that the year's profits would have exceeded £400,000. The lamentable coal strike dissipated that prospect, but, nevertheless, the net profit amounted to £358,990, an increase of £2,109 over 1925, which could be regarded as satisfactory. During 1926 there was some slackening in orders for public telephones. They completed the conversion of four exchanges in the Edinburgh area to automatic working, 12,000 lines being cut over successfully in October last, while in March this year the whole of the Sheffield area was converted and brought into service, having nine automatic exchanges with approximately 15,000 subscribers connected. These two systems now represented the two largest automatic areas in Britain, while the Sheffield transfer represented the largest number of exchanges ever simultaneously transferred to automatic working. Among overseas telephone contracts might be mentioned a telephone installation in the City Hall, Cape Town, public exchanges for Salisbury (Rhodesia), Vina del Mar (Chile), Nutana (Canada), as well as six exchanges in the Brisbane (Australia) area, the last totalling upwards of 12,000 lines. They had specialised, among other things, in the manufacture of the loaded type of submarine telephone cable for long-distance transmission. In addition to the supply and laying of another such cable between England and Belgium, which had provided greatly improved telephone facilities for the Continent, they also supplied a similar cable to British Columbia, connecting the mainland to Vancouver Island. There were good reasons for expecting business in this highly specialised type of cable to continue, as there were many parts of the world which, sooner or later, would want telephonic connection by means of submarine cables. Their plant for submarine telegraph cable was well occupied throughout 1926. In addition to the manufacture and laying of a submarine cable for connecting Bilboa, near Panama, and Santa Elena, Ecuador, they made a high-speed loaded cable of 2,143 nautical miles for the Pacific Cable Board, to connect Fanning Island and Fiji. In underground light and power cable their plant was again fairly well occupied, although many schemes requiring this class of cable were awaiting the passing of the Electricity Bill. Now that this measure had become law, power transmission schemes were being pushed, and at the present time their plant was well occupied with orders. During 1926 arrangements were completed for manufacturing a new type of e.h.p. cable (the "H" type), which it was believed would overcome many of the difficulties which had been experienced, and they had just been successful in securing a very important contract for supplying and laying a cable of this type for connecting the new station at Portishead to Bristol. That contract was of considerable interest, inasmuch as it was probably the first of such magnitude that has been placed in this country for "H" type cable. They had also secured the first important contracts to be placed for this type of cable in Australia, New Zealand, and Greece. The Australian contract was of considerable interest as it consisted of the supply and laying of a number of 33,000-V jointless submarine power cables across Sydney Harbour. Mining and marine apparatus showed an increased turnover. Progress on the technical side was being maintained. Excellent reports had reached them in regard to their direction-finding apparatus. He would also call attention to their short-wave apparatus, and in particular to the installation on the Cunard liner *Carinthia*, the first to be employed in the British Mercantile Marine, proving most satisfactory. Their overseas business had shown a notable expansion, mainly due to their having secured the orders previously mentioned for telephone exchanges. Business in South Africa carried out by their branch had shown steady progress, and they had recently registered a local company under the title of Siemens Bros. and Co. (British), Ltd. Regarding their prospects for the current year, he said that although the orders so far received in 1927 were in excess of those received in 1926, it would be too optimistic to assume under current conditions that the volume of orders for the remainder of the year would be sufficient to absorb their manufacturing resources. Competition was getting keener, and the margin of profit was consequently reduced. However, their products were chiefly required in connection with utility services, and there was every reason to expect that in course of time the demand for those services would again increase. The report and accounts were adopted.

Brush Electrical Engineering Co., Ltd.

The annual meeting was held on May 23rd. Mr. E. Garcke (chairman), who presided, in proposing the adoption of the report (*vide* our last issue, p. 810) said that the past year had not been very notable from the general point of view; the business done had been of a normal character, and the progress was satisfactory, having regard to all the circumstances. The company, among others, was prejudicially affected by industrial events, and but for those events the profits would have been larger. It was very satisfactory, however, that the net result was approximately the same as for 1925. The gross profit was about £10,000 less, but the total expenses were nearly £9,000 less; the net result was about £700 better than in the preceding year. The company's liquid resources were now over £300,000, compared with the share and debenture capital of about £750,000. Although the accounts showed considerable financial strength, it was not the best economic position to have over £300,000 of liquid resources earning only about 5 per cent. It was prudent, however, to keep those resources liquid, because they hoped for improvement in engineering prosperity, and then the spare cash resources would be available, and needed, for carrying a much larger volume of business than at present. All the main departments were kept well occupied throughout the year. Important contracts were carried out for turbo-generators and transformers for both home and abroad. Their Brush-Ljungström turbine plant continued to hold its own in competition with other turbines. Recently they booked an order for Hull for two 12,500-kW turbo sets immediately upon the completion of a previous contract for two 7,000-kW sets for the same authority. The rolling stock department was taxed to the fullest capacity on tramcars and omnibuses. A marked improvement had taken place in the view held by municipalities and companies owning tramway undertakings with regard to the renewal of rolling stock, and substantial contracts had been carried out for corporations, among others Birmingham, Leeds, Bournemouth, Cardiff, West Ham, and East Ham. Their present order list compared favourably with that for the same period last year. Extensions to the buildings and machine tools were in hand, to enable them to deal with larger units and with increased demand. The intense competition, to which previous reference had been made, did not show any sign of slackening. That applied particularly to overseas contracts. The company had no intention whatever of joining in suicidal competition to the extent of carrying out orders without a moderate profit or, as some firms were doing, at a ruinous loss. Mr. Garcke then went into some details regarding the co-partnership scheme which was dealt with in the report, and said that it was a question for the shareholders to decide how the increase in the undivided profits account derived from the allocation of surplus profits should be dealt with. The directors intended to take the matter into careful consideration and submit a recommendation at the next meeting. In respect of the surplus for 1925, the employés unanimously agreed to receive their bonus in ordinary shares. A certain number of those shares were sold on the market by the recipients, but the proportion of the shares sold was, he considered, less than was to be expected in the circumstances. So far as their short experience extended, the co-partnership scheme had had a beneficial effect. The report and accounts were adopted.

Anglo-Portuguese Telephone Co., Ltd.

The *Financial Times* states that with the change in the chairmanship of this company—Viscount St. Davids retiring and Sir Alexander Roger taking his place—there has been a change in the control of the company. Our contemporary says:—"In this deal it is understood that Sir Alexander Roger brought together trust companies and individuals specialising in telephones to purchase the undertaking from the existing interests—mainly companies in which Viscount St. Davids is interested. While the price paid for shares is not known, it is believed to be substantially over par. Debenture stock has also been secured. This deal is an answer in part to the well-known attempt by important American interests to obtain control of international telephone communications."

Our contemporary quotes an "authority" very closely in touch with international telephone matters, to the effect that the deal will keep control out of the hands of important American interests which are endeavouring to secure a hold on all telephone companies, and will be of great advantage to Britain. "With control in British hands, all orders for

new plant will come to this country." Extensions to the Anglo-Portuguese system anticipated during the next ten years are expected to represent an expenditure of £1,500,000 to £2,000,000. "The acquiring group has all the necessary expert and financial resources to enable the company to function to its utmost capacity."

Pernambuco Tramways and Power Co., Ltd.

The annual meeting was held on May 17th. Mr. W. Higgins, O.B.E. (chairman), who presided, said that the expansion of business and the improvement in the exchange had produced satisfactory results. The number of electricity consumers had increased, and the new 6,000-kW set was put into operation on April 24th last. After reviewing the accounts and mentioning that £8,000 had been placed to reserve, the chairman spoke of the decree for the stabilisation of the exchange at 6d. That, he said, militated against the chances of the improvement which was expected from the rising exchange, and the receipts for the current year showed a decrease. The Brazilian Government should realise that foreign capital could not be remunerated with such a low rate as the current one. The tramway fares remained the same whether the exchange was 6d. or 1s. When the original concession was obtained, the exchange was 15d. or 16d. The company would also be adversely affected by the withdrawal of the abatement of duties on material imported by the company: it would probably mean an additional annual outlay of £10,000. There was no question of protecting home industries, and he hoped that the Government would see its way to modify its action. In conclusion, Mr. Higgins said that the company was considering the running of an experimental omnibus service.

New Issues.

Thomas Bolton & Sons, Ltd.—On Monday last this company offered for subscription £300,000 of 6 per cent. first mortgage debentures of £100 each at £98 per cent. The debentures are repayable at £102 per cent. on April 1st, 1947, or at £104 on six months' notice, after 1932, at the company's option. The liquid assets of the company are said to exceed by over £500,000 the amount of the issue. The bulk of the proceeds (£216,360) will be used to redeem the existing debentures of the company and the balance for working capital. The issue was over-subscribed and the lists were closed on Monday.

Metropolitan District Railway Co.—The *Financial Times* reports that arrangements are understood to have been completed for the issue of £500,000 5 per cent. debenture stock, redeemable in 1943, or earlier at the option of the company. It is stated that the stock has been sold to a financial group at 95 per cent., free of stamp duty.

Madras Electric Supply Corporation, Ltd.

After providing for debenture service the net profit for 1926 is £58,061, and to it is added £5,550 brought forward, making £63,611. It is proposed to pay a final dividend of 5½ per cent., free of tax, on the ordinary shares, making 8 per cent. tax-free for the year (as for 1925); to transfer £5,124 to general reserve; to devote £2,736 to additional remuneration to directors; and to carry forward £5,907. In November last the capital was increased to £800,000, and an issue of 110,000 ordinary shares was made to existing shareholders at the price of 25s. 6d. each; the premium after deducting expenses has been credited to the general reserve. The new shares rank for dividend from July 1st last. The tramways show an available balance of £13,166, as against £21,515. The dividend on the 6 per cent. preference shares has been paid and £7,166 carried forward. Meeting: May 30th.

Shanghai Electric Construction Co., Ltd.

The net profit for 1926 was £122,410, as compared with £72,159 for 1925. Adding the balance brought forward, the amount available is £127,570. Of this £40,000 has been allocated to renewals, £5,000 for taxation, and £1,831 to staff provident fund. In view of the unsettled conditions in Shanghai the directors propose to restrict the final ordinary dividend to 6 per cent., making 10 per cent., as in 1925; £30,739 is carried forward. It is the directors' intention, when conditions are more favourable, to pay off bankers' advances and make an issue of capital. The first year of operation of the Singapore Traction Co., Ltd., resulted in the company receiving £10,000 in respect of its half share of profits. The Singapore company's revenue from lighting came to an end upon the opening of the municipal station in October last. Meeting: June 1st.

British Electric Traction Co., Ltd.

As we briefly reported in our last issue, a proposal for the issue of a bonus of 10 per cent. to ordinary stockholders, in the form of deferred ordinary stock, was approved at an extraordinary meeting last week. Mr. J. S. Austen (chairman), introducing the resolutions, said that under the proposed arrangements the preference stock would receive a cumulative dividend of 6 per cent.; then the ordinary stock, which would be known as 8 per cent. non-cumulative preferred ordinary stock, would receive 8 per cent.; then the preference stock would participate with the new deferred stock until the former had received 8 per cent., the deferred stock at the same time receiving what would otherwise have gone to the existing ordinary stock, being also entitled to all the remaining profits. That method was adopted on account of an agreement which precluded the issue of ordinary stock as a bonus. The amount of 10 per cent. was fixed as a basis on which they could reasonably expect to make a satisfactory distribution. Referring to the results of the past year, Mr. Austen said that they were practically the same as those of the previous year, and were much better than had been anticipated. In conclusion he asked the ordinary stockholders to regard the new stock as a means by which they would recover not only all the capital which had previously been lost, but something more.

Cawnpore Electric Supply Corporation, Ltd.

The surplus on the past year's working was £61,761, and after deducting debenture interest and adding £3,700 brought forward there is an available amount of £52,721. From this £10,000 is transferred to depreciation and renewals reserve, £2,000 to general reserve, and £6,778 to sinking fund; £3,671 is written off share and debenture issue expenses, and after paying the preference dividend and a final dividend of 7 per cent. (making 10 per cent.) on the ordinary shares, £2,512 is carried forward. The report was accompanied by a striking view of the company's Riverside station, Cawnpore. Meeting: May 30th.

Yorkshire (Woollen District) Electric Tramways Co., Ltd.

The report for 1926 states that the receipts were £193,972, and after meeting all expenses, including £27,900 for renewal fund, there remains £21,083, to which is added £29,271 brought forward, making £50,354. It is proposed to pay a dividend of 6 per cent. on the ordinary shares for the year and to transfer £10,000 to reserve, leaving £27,154. The directors aim at maintaining the 6 per cent. dividend, and accordingly propose to pay a further 3 per cent. on the ordinary shares (as last year), making up the full dividend for 1921 when no distribution was made. This reduces the balance to be carried forward to £21,874.

English Electric Co. of Canada, Ltd.

The report presented at the annual meeting at Montreal on May 9th, showed that the company had materially improved its position, profits being much in excess of those of any previous year. The company benefited particularly from the expansion which took place in the pulp and paper industry, as well as from activity in the mining industry, and the extensive water power development. Profits for the year were $203,156, as against $74,003 in 1925, and $94,092 in 1924. After paying 3½ per cent. on the cumulative preference stock amounting to $70,000, as compared with $50,000, the balance carried forward to profit and loss was $384,311, as against $293,848 a year ago.

Stock Exchange Notices.

The undermentioned have been ordered to be officially quoted:—

Atlas Light and Power.—£889,757 5 per cent. debenture stock.

Consolidated Gas, Electric Light and Power of Baltimore.—82,794 common shares of no nominal or par value.

Application has been made to the Committee to allow the following to be officially quoted:—

City of London Electric Lighting.—400,000 ordinary shares of £1 each, fully paid, Nos. 1,500,001 to 1,900,000.

Chloride Electrical Storage Co., Ltd.

The profit for the past year was £158,666, as compared with £157,395 in the preceding year. A final dividend of 5 per cent., free of tax, making 10 per cent., free of tax, for the year, has been declared on the ordinary shares, together with a bonus of 2s. per share, also tax free. A similar distribution was made in respect of 1925. £50,000 is transferred to general reserve (making £225,000); £25,000 is put to depreciation reserve; £10,000 to employés' benefit fund; and £47,352 is carried forward.

Weston-super-Mare and District Electric Supply Co., Ltd.

The net revenue for 1926 was £34,448, as compared with £34,881 for 1925. After meeting all expenses, including £14,000 for renewals, there is a surplus of £10,721 (against £12,247). To this is added £6,204 brought forward, making £16,925. It is proposed to transfer £4,000 to reserve and to pay a dividend of 10 per cent. on the ordinary shares, leaving £4,525 to be carried forward.

Iron Trades Employers' Insurance Association, Ltd.

The report for 1926 shows a premium income of £308,969 and total receipts of £627,577. From the surplus of £160,918 the directors propose to return 10 per cent. on the Workmen's Compensation premium paid for 1926, together with a bonus of 15 per cent., for which income tax has already been paid.

Merthyr Electric Traction and Lighting Co., Ltd.

The net revenue for the past year fell from £27,337 to £24,072, and the net surplus from £7,230 to £4,648. It is proposed to pay the 5 per cent. preference dividend and carry forward a balance of £3,148. The adverse results are attributed to last year's industrial troubles. Meeting: May 30th.

British Thomson-Houston Co., Ltd.

The annual meeting was held on May 24th, Mr. H. C. Levis presiding. In moving the adoption of the report (ELEC. REV., May 20th, p. 809), the chairman, after referring with regret to the deaths of Messrs. C. A. Coffin and A. W. Burchard, directors, said that Mr. C. H. Minor had been appointed a member of the board since the last meeting. During the year under review the company again had to face keen competition. In addition, the general industrial conditions arising from the prolonged coal dispute affected them seriously, and resulted in a smaller input to their factories of orders which could be completed during the year; that in turn meant a smaller amount invoiced to customers, with the result that the profits for the year were decreased, and they were unable to recommend the payment of a dividend on the ordinary shares. Now that the effects of the coal strike were beginning to disappear and the uncertainty regarding the Electricity Bill had been removed, the position with respect to new orders had improved, and they had on hand to-day a considerably larger volume of orders than they had at any time during the past year. The outlook for the present year was favourable provided they did not again suffer from disturbed industrial conditions. The orders, beside those for use at home, included many important ones from every part of the Empire, from Japan and China, practically all of the countries of South America, Mexico, Cuba, Egypt, and Siam. Some of those orders, on account of their size or of the special engineering features involved, were unique in the history of British electrical engineering. Mr. W. C. Lusk, the managing director, seconded the motion, and the report was adopted.

West Gloucestershire Power Co., Ltd.

Presiding at the recent annual meeting, the chairman (Mr. J. Davidson) said that, in spite of the mining dispute, the sale of energy and the revenue had increased. During the year special campaigns had been carried out by the company and schemes for the assisted wiring of small premises and the hire of appliances had been instituted. The prospects were favourable; the receipts during the first three months of this year had shown a satisfactory increase as compared with the first quarter of 1926.

Lewes and District Electric Supply Co., Ltd.

The net receipts for last year rose from £9,545 to £10,683, and the net surplus from £3,550 to £3,868. It is proposed to repeat the dividend of 10 per cent. on the ordinary shares, to place £2,000 to reserve (against £1,000), and to carry forward £3,667.

Auckland Electricity Loan.

The Auckland (N.Z.) Electric Power Board has decided to borrow £150,000 in Australia for electrical development. The net interest is £5 10s. per cent., while the best London offer was £5 12s. 6d. per cent.

Veritys, Ltd.

The directors state that they hope to put forward this year proposals for dealing with the arrears of dividend on the cumulative preference and preferred ordinary shares.

Doulton & Co., Ltd.

A dividend of 6 per cent. has been declared on the ordinary shares (against 7½ per cent.).

Swiss Companies.

The *Société d'Exploitation des Câbles Electriques* (*Berthoud, Borel & Co.*), Cortaillod, reports a net profit of £52,132 for the past financial year, as compared with £40,964 in 1925. The position of the company is unique in that the balance sheet shows no liability for capital, this having been entirely returned to the shareholders in 1920, to whom were then issued 5,000 participating certificates. After making provision for depreciation, &c., a sum of £36,000 is being distributed to the certificate holders at the rate of £7 5s. per certificate, as against £6 8s. in 1925.

The *Société Franco-Suisse pour l'Industrie Electrique*, Geneva, reports a net profit of 1,092,917 fr. for the past year, as compared with a loss of 3,920,410 fr. in 1925. A dividend of 4½ per cent. is being paid on the preference shares.

Austrian Company.

The *Felten and Guilleaume Company*, of Vienna, whose relations with the German parent company in recent years have become closer, reports net profits of 1,360,000 schillings, as compared with 890,000 schillings in 1925, and a dividend of 9 per cent., as against 6¾ per cent. in the previous year, has been declared. The production of long-distance cables, which was taken up as a new branch, afforded activity for the Vienna works during the whole of the year, while an improvement at the Styrian wire works only took place after the increase in the import duties. The export trade was difficult and was not profitable.

Swedish Company.

The *Nya Luth & Rosens Elektriska A.B.*, which acquired most of the assets of the former concern of the same title last July, states that it was not possible to work at full capacity. The turnover was considered satisfactory, however, although the sale prices were on a very low level.

German Company.

Voigt and Haeffner, Frankfort-on-Main, report that in general the electrical industry was not employed in proportion to its capacity so that extremely keen competition took place. The net profits declined from 664,000 marks to 521,000 marks, and the dividend is reduced from 8 per cent. to 6 per cent. An improvement is reported to have taken place in the current year.

French Company.

The *Compagnie Radio-France* proposes to pay a dividend of 46.80 fr. per share for 1926, as compared with 30 fr. for 1925.

Stocks and Shares.

MONDAY EVENING.

MOST people who are interested in stocks and shares have felt a tinge of disappointment at the Bank Rate being retained at 4½ per cent. instead of its falling to 4 per cent., as it was expected to do last week. Gold has been going out of the country so freely as to quench the hopes of any early drop to the level 4 per cent. in the rate, though as the money position changes with kaleidoscopic rapidity, there are still optimists who look for an early cut to the level 4 per cent. The disappointment has had a somewhat depressing effect upon prices of stocks and shares all round, in addition to those which are immediately affected through their close association with the money market.

New issues have gone back a little, and a good many others which were projected are postponed for the time being. This postponement is by no means a bad thing, because the new issues had been rushed out so precipitately as to arouse talk of possible indigestion in the stock markets. A pause to the flood of new borrowing will give time for the recent comers to settle into more permanent hands than those of the underwriters and stags, who, it may be, still hold a good part of certain offerings made lately.

The County of London Electric debenture, the price of which touched 1¾ premium, remains at 1¼ premium quoted a week ago. The Electrical Finance and Securities 5½ per cent. debenture stock, offered at 92½ is about ¼ premium, and the 7 per cent. cumulative preferences, which changed hands at a very small discount, strengthened to their par price, and attracted buyers. B.A. Lacroze 6½ per cent. debenture stock can be obtained at the issue price of 96½ or a little cheaper, free of stamp and fee, the yield being 5¾ per cent. outright, and 4s. per cent. more, allowing for redemption. The first interest payment is a partial one, due in November.

Another new issue of interesting character is the Metropolitan District Railway 5 per cent. debenture stock, redeemable 1933-1943, which has just come into the market for sale at 95 ex dividend. Interest payments are due in December and June. The yield, at the present price, is £5 5s. 3d. per cent. Taking redemption into account at the longer of the two dates, the return is raised to 5¼ per cent. on the money. Not many years ago District debenture was a security tinged with speculative flavour, but in view of the remarkable manner in which the company has gone ahead, the new stock can be characterised as a first-rate investment, carrying in it the probability of a quiet rise to the neighbourhood of three figures as the stock becomes settled down into investment hands and as money grows cheaper.

There is very little prior-charge Tube Railways' stock offering at present, apart from a small amount of District 6 per cent. debenture obtainable at 114¼, January and July dividends, paying £5 6s. per cent. on the money, and about £2,000 of the same company's 4 per cent. Power House Rent Charge at 77, yielding £5 5s. 6d., also with interest due in January and July. Metropolitan Railway 3½ per cent. debenture, a full trustee stock, can be bought at 70¼, though the yield in this case is barely 5 per cent. on the money, and an oddment of the railway's 5 per cent. preference might be bought at 91¼, February and August dividends, at which price the return would be 5½ per cent. The debenture stocks of the steam railways pay between 5 and 5½ per cent., the higher yield being offered by the London & North-Eastern Railway issues.

Metropolitans have dropped to 62½, and Districts, at the same price, are half a point down, the decline in the latter being due to the appearance of the new debenture stock. Underground Electrics are steady. British Electric Traction

ordinary has shed a couple of points, the 6 per cent. preference stock, however, being the fraction up at 120½. London United Tramway debenture advanced to 52½. The British Electric Traction Company has declared its usual dividend of 5 per cent., making 8 per cent. for the year, and the preference, as already announced, will receive an extra 2 per cent., also making 8 per cent. for 1926. The bonus of 10 per cent. on the ordinary stock is to be satisfied by the distribution of a new deferred ordinary stock to be created, and at the same time, steps are being taken to convert the ordinary stock into preferred.

The cable market is good, and fresh rises have been secured by the Eastern group. Eastern Telegraph is up 1½, Eastern Extensions 10s., and Westerns 2s. 6d. The Eastern Extension report shows a profit for last year of £1,116,000, an increase of £110,000 over the previous twelve months. The Eastern company made a profit of £1,098,000, a reduction of £330,000 on the year. This result is attributed to an increase in the expenses. The dividends on both companies continue at 10 per cent. free of tax for the year, and the financial position of the undertakings remains exceedingly strong. The Eastern Telegraph has reserves amounting to £3,230,000. Its issued capital is £7,000,000 in ordinary and £2,000,000 in debentures. The Eastern Extension's capital is 4¾ millions, and the company has nearly £4,000,000 in reserves.

The feature in the telegraph and telephone group is the manner in which South American telephone shares have gone ahead. For weeks past there have been steady rises in United River Plates, and a fresh gain of 2s. 6d. has lifted the price to 9¾. Chili Telephones are 10s. up at 7¼, and Orientals retain their rise of last week at 53s. 6d. With each week's rise in prices, curiosity becomes more piqued as to the reason which lies at the back of the buying that has brought about these substantial gains, and gossip grows stronger as to the possibility of the companies being taken over by some other group whose presumed purchases for control have brought about the handsome price appreciation.

Great Northern Telegraphs are easier at 28½. Anglo-Portuguese Telephones are 1, showing a trifling decline.

Mexican utility issues are reactionary after their recent remarkable rises. Mexican Light & Power preferred, which went up to 115 a fortnight ago, have gone back to 110, and the common stock is a little easier at 44. On the other hand, Mexico Tramway bonds continue their rise at 81½. The reaction in Mexican Light preferred follows the ordinary course: the satisfactory news which had been expected in regard to a reorganisation of the capital having been published, people who had bought the stock on the anticipation of this announcement are content to take the excellent profits that they can secure by selling. Brazilian Tractions after a somewhat abrupt dip, shot up to 146½, which left the prices better on the week, but Barcelona Tractions, Sidros and others in this class, are disposed to droop by reason of the superior attractions offered by American Celanese and certain other shares which have recently sprung into popularity.

Changes in the prices of electricity supply shares are few and far between. The disappointment felt at the retention of the Bank Rate at 4½ per cent., when 4 per cent. had been commonly expected, became reflected in a slight dulness which crept into investment securities. This affected a wide area of stocks and shares, and it was accompanied by the talk of financial accommodation becoming contracted as the end of the first half of the year gets nearer. Bournemouth and Poole are weaker at 55s. 6d. Newcastle-on-Tyne ordinary eased off to 23s. There are no changes at all in the ordinary shares of the London electricity companies, but Charing Cross preference at 17s. 6d. have gained the pennies. Urban 5½ per cent. debenture came into demand at 99½.

Telephone Manufacturing shares have been sold with persistence, and the price dropped to 6s. International Automatics are better at 38s. 9d., while Automatic Telephones have not changed from 45s. Marconi shares touched 20s., then went back to the previous price of 18s. 9d., but the market is a good one and it is considered, in serious quarters, that the price is likely to harden. The argument rests upon the impression that, free from internal troubles and with a reorganised capital account, the Marconi Company is at last in a position to take advantage of the opportunities and the experience that lie at the command of the undertaking. But the day-to-day speculator knows that disappointment dogs the heels of the gambler in Marconi shares. Marconi Marines are higher at 27s. The rise of 1½ per cent., to 8¾ per cent., in the dividend has encouraged anticipations of 10 per cent. for the current year. Canadians keep closely to 4s.

Manufacturing shares are disposed to be dull for choice. Cromptons make an outstanding exception with a half-crown gain at 12s. 6d. Henley's, Callender's and British Insulated have surrendered a little of their recent advances. The reason is to be found in the report of the British Thomson-Houston Company, showing a reduction of £111,600 in the profit, to £355,400, as compared with £467,000 in 1925. The ordinary share capital, of two million pounds sterling, then received 6 per cent., but is to go dividendless for 1926. General industrial conditions and the strike are blamed for the contraction in the company's earnings. The preference shares stand at 22s. 6d., the 4½ per cent. debenture at 88, and the 7 per cent. debenture, redeemable, at 103½. Ever-Ready shares have gone back to 83s. 9d. The engineering list is listless and somewhat heavy, Babcock receding to 53s. 9d. The rubber market presents no points of fresh interest.

Share List of Electrical Companies.

	Nom.	Dividend. 1925.	Dividend. 1926.	Price May 23 1927.	Rise or fall.	Yield. p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	£1	14	14	55/6	—1/6	5 0 11
Brompton Ordinary	1	10	8¾	25/-	—	5 12 0
Charing Cross Ordinary	1	15	8½	25/-	—	5 12 0
do. do. 4½ Pref.	1	4½	4½	17/6	+6d.	5 2 10
Chelsea	1	12	8¾	25/-	—	5 12 0
City of London	1	15	10	11⅜	—	5 1 10
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Clyde Valley	1	8	8	30/6	—	5 5 0
County of London	1	15	7½	28/-	—	5 0 0
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	7	8	26/9	—	5 19 8
do. 7% Pref.	1	6	7	23/6	—	5 19 2
Elec. Supply Corporation	1	10	10	32/-	—	6 5 0
Kensington Ordinary	1	15	8	25/-	—	5 12 0
Lancs. Light and Power	1	7½	7½	27/-	—	5 11 1
London Electric	1	10	8½	24/-	—	5 16 8
do. do. 6% Pref.	5	6	6	5⅝	—	5 6 8
Metropolitan	1	11	8	29/-	—	4 16 7
do. 4½% Pref.	1	4½	4½	17/-	—	5 2 10
Midland Counties	1	5½	6	22/6	—	5 6 8
Newcastle-on-Tyne Ordinary	1	7	5	23/-	—6d.	4 6 11
do. 5% Pref.	1	5	5	17/6	—	5 14 3
do. 7% Pref.	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	10	—	6 0 0
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	8	25/6	—	5 9 10
South London	1	15	8½	25/-	—	5 12 0
South Metropolitan Pref.	1	7	7	1⅛	—	6 3 0
Urban Ordinary	1	4	7	27/-	—	5 3 8
do. 6% Pref.	1	6	6	1/5/-	—	5 13 0
Westminster Ordinary	1	15	8¾	25/-	—	5 12 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	20/6	—	7 6 4
Yorkshire Elec.	1	8	8	29/6	—	5 8 4
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	71	—	5 12 8
Metropolitan	,,	5	3	62½	—1½	4 16 0
do. District	,,	3½	3½	62½	—½	5 12 0
Underground Electric	£1	Nil	1½	18/6	—	1 12 5
do. do. Income	Bonds	6	6	102	—	*5 17 8
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	101	—	5 19 0
do. Def.	,,	1½	1½	24½	—	6 3 9
Automatic Telephone	1	8	10	45/-	—	4 9 0
Chili Telephone	5	5	6	7⅞	+10/-	3 17 5
Eastern Extension	10	10	10	18⅜	+½	*5 7 3
Eastern Tel. Ord.	Stock	10	10	181½	+1½	*5 10 2
Globe Tel. and T. Ord.	10	10	10	18⅜	—	*5 6 0
do. do. Pref.	10	6	6	11	—	5 8 1
Great Northern Tel.	10	20	20	28½	—½	7 1 7
Indo-European	25	8½	10	46½	—	*5 7 6
Marconi	1	Nil	Nil	18/9	—	... ...
Marconi-Marine	1	7½	8¾	27/-	+1/6	6 9 8
Oriental Telephone Ord.	1	12	12	53/3	—	*4 9 9
United R. Plate Tel.	5	8	8	9¾	+⅛	*4 5 4
Western Telegraph	10	10	10	17½	+⅛	*5 14 3
HOME AND FOREIGN TRAMS, &C.						
Anglo-Arg. Trams First Pref.	5	5½	5½	9½	—	7 17 2
do. do. 2nd Pref.	5	6	6	3¼	—	8 2 8
do. do. 5% Deb.	Stock	5	5	72½	—	6 18 0
British Electric Traction Ord.	,,	8	—	148	—2	5 8 1
do. do. 6% Pref.	,,	6	8	120½	+½	6 12 10
Brazil Traction	100	5	6	146½	+5	4 1 8
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	89½	—	5 11 9
do. do. Preferred		6⅞	6⅞	118½	—	5 5 6
do. do. Deferred	,,	8	—	158	—	*5 1 3
do. do. Deb.	,,	4½	4½	80½	—	5 5 7
London & Sub. Trac. 5% Pref.	1	Nil	Nil	7/9	—	Nil
London United Tram. Deb.	Stock	4	4	52½	+1½	7 12 5
Mexico Trams, 5% Bonds	—	5	5	81½	+1	6 2 8
Mexican Light Common	100	Nil	Nil	44	—1	Nil
do. Pref.	100	Nil	Nil	110	—3	Nil
do. 1st Bonds	—	5	5	74½	—	6 14 3
Yorkshire (West Riding)	1	5	—	8/9	—	... ...
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	13	13	53/9	—9d.	4 16 11
British Aluminium Ord.	1	12½	10	43/9	—	4 11 4
British Elec. Transformer Pref.	1	Nil	7	18/3	—	7 13 6
British Insulated Ord.	1	15	15	67/6	—1/3	4 8 11
Brush Ord.	1	10	10	28/3	—	7 1 7
Callenders	1	15	—	3 1/16	- 1/8	4 7 3
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	12/6	+2/6	... ...
Edison-Swan	£/-	10	10	10/	—	4 0 0
do. 5% Deb.	Stock	5	5	85	—	5 17 8
Electric Construction	1	10	10	28/9	—	6 19 9
Enfield Cable Pref.	1	7½	7½	1⅛	—	6 6 4
English Electric	1	Nil	Nil	10/-	—	... ...
do. do. Pref.	1	8	—	12/6	—	... ...
Gen. Elec. Pref.	1	6½	6½	23/6	—	5 10 8
do. Ord.	1	7½	—	30/6	—	4 18 4
Henley	1	20	—	83/9	—3d.	4 9 5
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	5	1⅛	—	*4 9 0
Johnson & Phillips	1	17½	12½	2½	—	5 0 0
Met.-Vickers Ord.	1	8	8	27/6	—	5 11 4
do. Pref.	2	8	8	2⅜	—	6 14 9
Siemens Ord.	1	7½	7½	28/6	—	5 5 9
Telegraph Construction	13	10	10	28½	—	*4 4 9

* Dividends paid free of Income Tax.

French Foreign Electrical Trade.

Distribution of Imports and Exports.

THE French Government has now published a detailed statement of the foreign trade of France, by countries, for 1925. From this the following figures relating to imports and exports of electrical and allied material have been extracted. Comparative figures for 1924 are given and a note is added of increases or decreases. The metric quintal = 220 lb.

Exports.

	Metric quintals. 1924.	1925.	Inc. or dec.
Dynamo-electric machinery—			
Total	40,780	47,977	+ 7,197
To Belgium	15,000	9,185	− 5,815
„ Switzerland	438	597	+ 159
„ Spain	5,195	3,607	− 1,585
„ Algeria	2,666	4,370	+ 1,704
„ Tunis	1,138	1,053	− 85
„ Morocco	1,452	2,419	+ 967
„ Indo-China	1,010	3,315	+ 2,305
„ Egypt	835	1,351	+ 516
Electrical and electro-technical apparatus—			
Total	43,632	39,888	− 3,744
To Great Britain	2,448	2,581	+ 133
„ Belgium	10,865	10,114	− 751
„ Switzerland	1,275	1,330	+ 55
„ Spain	5,421	5,372	− 49
„ Algeria	3,107	3,757	+ 650
„ Morocco	1,739	1,824	+ 85
„ Indo-China	1,112	1,737	+ 625
„ Italy	1,483	2,240	+ 757
Dynamo and motor frames—			
Total	333	90	− 243
To Germany	—	38	+ 38
„ Spain	17	7	− 10
„ Algeria	20	16	− 4
„ Morocco	218	25	− 193
Insulated wires and cables—			
Total	52,367	23,727	−28,640
To Belgium	2,425	2,043	− 382
„ Egypt	1,397	1,377	− 20
„ Algeria	7,395	7,500	+ 105
„ Tunis	1,502	1,839	+ 337
„ Morocco	*	2,593	—
„ Spain	927	1,302	+ 375
„ Great Britain	801	2,222	+ 1,421
Armatures and parts for electrical apparatus—			
Total	9,904	11,649	+ 1,745
To Belgium	1,409	3,536	+ 2,127
„ Spain	693	506	− 187
„ Great Britain	1,127	727	− 400
„ Algeria	651	984	+ 333
„ Morocco	637	659	+ 22
„ Germany	—	1,103	+ 1,103
Incandescent electric lamps—			
Total	2,523	2,705	+ 182
To Great Britain	142	430	+ 288
„ Belgium	358	174	− 184
„ Algeria	362	299	− 63
„ Indo-China	500	437	− 63
Accumulators and parts—			
Total	6,903	7,896	+ 993
To Great Britain	1,436	2,154	+ 718
„ Belgium	1,599	1,556	− 43
„ Spain	366	564	+ 198
„ Algeria	745	739	− 6
„ Morocco	495	420	− 75
Dry cells—			
Total	2,963	2,988	+ 25
To Great Britain	440	1,198	+ 758
„ Belgium	1,096	556	− 540
„ Algeria	239	184	− 55
„ Morocco	150	140	− 10

Imports.

	Metric quintals. 1924.	1925.	Inc. or dec.
Dynamo-electric machinery, 1,000 kg. and over—			
Total	12,912	19,903	+ 6,991
From Belgium	—	1,298	+ 1,298
„ Germany	895	5,438	+ 4,543
„ Switzerland	6,482	8,584	+ 2,102
„ United States	3,673	1,199	− 2,474
„ Great Britain	574	1,808	+ 1,234
Dynamo-electric machinery, 50-1,000 kg.—			
Total	6,780	5,609	− 1,171
From Switzerland	1,863	1,789	− 74
„ Belgium	977	572	− 405
„ United States	825	498	− 327
„ Germany	670	1,211	+ 541
„ Great Britain	726	784	+ 58
Dynamo-electric machinery, less than 50 kg.—			
Total	7,155	5,609	− 1,546
From Germany	*	1,211	—
„ United States	4,949	498	− 4,451
„ Italy	852	298	− 554
„ Switzerland	237	1,789	+ 1,552
Electrical and electro-technical apparatus, with insulated windings—			
Total	10,161	7,036	− 3,125
From Great Britain	3,175	1,470	− 1,705
„ Germany	932	1,679	+ 747
„ Switzerland	1,294	1,076	− 118
„ United States	3,108	1,300	− 1,808
Ditto, without insulated windings—			
Total	5,020	4,779	− 241
From Great Britain	1,048	845	− 203
„ Switzerland	1,018	1,033	+ 15
„ United States	1,247	860	− 387
„ Germany	438	1,110	+ 672
Dynamo and motor frames—			
Total	1,560	842	− 718
From Great Britain	287	52	− 235
„ Belgium	1,273	788	− 485
Insulated wires and cables—			
Total	1,443	3,057	+ 1,614
From Great Britain	246	949	+ 703
„ Switzerland	344	496	+ 152
„ United States	289	657	+ 368
„ Italy	229	522	+ 293
Armatures and parts for electrical apparatus—			
Total	7,926	4,827	− 3,099
From Great Britain	817	377	− 440
„ Switzerland	1,539	1,561	+ 22
„ United States	1,399	1,162	− 237
„ Germany	817	636	− 181
Metal-filament lamps, mounted—			
Total	4,972	5,093	+ 121
From Holland	4,509	4,370	− 139
Ditto, unmounted—			
Total	56	77	+ 21
Accumulators and parts—			
Total	5,687	8,220	+ 2,533
From Great Britain	4,112	6,078	+ 1,966
„ Belgium	277	577	+ 300
„ Switzerland	698	60	− 638
„ Czecho-Slovakia ...	*	741	—
Dry cells—			
Total	116	105	− 11
From Denmark	96	85	− 11

* Figures not available.

Electric Ploughing in France.

A party of members of the Société Française des Electriciens recently visited Puiseux (Seine et Oise) to inspect a new system of electric ploughing which has recently been introduced there by the Société des Travaux Electriques. The electric power available is 15,000-V, three-phase, which, by means of a country-type transformer station, is stepped down to 500 V. A flexible cable conducts the power at this pressure to a winch operated through reduction gearing by a 60-h.p. three-phase motor. The winch cable lies on the ground and passes round four pulleys fixed at the corners of the field to be ploughed, so that the plough connected with the cable can reach any part of the field. The Travaux Co. states that the consumption of energy is about 100 kWh per hectare of ploughed land.

The Electrical Imports of Egypt.

THE following statement, showing the imports of electrical and similar goods into Egypt during the year 1926 is taken from the recently-issued trade statistics. The figures for 1925 are added for purposes of comparison, and notes of any increases or decreases are given :—

	1925. £E	1926. £E	Inc. or dec. £E
Electrical machinery and parts—			
Total	165,000	152,000	– 13,000
From Great Britain ...	31,000	21,000	– 10,000
,, United States ...	6,000	14,000	+ 8,000
,, France	52,000	41,000	– 11,000
,, Italy	12,000	19,000	+ 7,000
,, Switzerland	10,000	11,000	+ 1,000
,, Germany	29,000	31,000	+ 2,000
Internal combustion engines, stationary—			
Total	650,000	425,000	–225,000
From Great Britain ...	371,000	215,000	–156,000
,, France	4,000	4,000	—
,, Italy	7,000	12,000	+ 5,000
,, Switzerland	135,000	55,000	– 80,000
,, Germany	123,000	115,000	– 8,000
Electric lamps—			
Total	45,000	40,000	– 5,000
From Great Britain ...	1,600	2,600	+ 1,000
,, Germany	9,600	7,000	– 2,600
,, France	2,000	1,400	– 600
,, Holland	15,000	16,000	+ 1,000
,, Czecho-Slovakia ...	1,300	300	– 1,000
,, Austria	7,000	8,000	+ 1,000
Carbon rods for arc lamps—			
Total	500	600	+ 100
Electric cars and wagons—			
Total	1,000	6,000	+ 5,000
Telegraphic and telephonic apparatus and fittings—			
Total	121,000†	—	—
From Great Britain ...	92,000	—	—
,, France	3,600	—	—
,, Sweden	22,000	—	—
Telegraph and telephone apparatus, ordinary—			
Total	*	30,000	—
From United Kingdom ...	*	11,000	—
,, Sweden	*	18,000	—
Radio apparatus—			
Total	*	2,000	—
Telephone and telegraph parts and fittings, wireless or not—			
Total	*	70,000	—
From United Kingdom ...	*	35,000	—
,, Sweden	*	30,000	—
Meters, electric, gas and water—			
Total	26,000	27,000	+ 1,000
From Great Britain ...	3,000	1,000	– 2,000
,, France	16,000	14,000	– 2,000
,, Germany	3,000	5,000	+ 2,000
Electric and gas pendants—			
Total	64,000	63,000	– 1,000
From Great Britain ...	2,000	1,400	– 600
,, France	28,000	32,000	+ 4,000
,, Germany	15,500	14,000	– 1,500
,, Italy	12,500	10,500	– 2,000
Electro-medical apparatus—			
Total	9,300	16,600	+ 7,300
From Germany	4,400	8,600	+ 4,200
Other electric appliances and batteries—			
Total	44,000	53,000	+ 9,000
From Great Britain ...	9,000	14,000	+ 5,000
,, Austria	600	300	– 300
,, France	6,800	6,600	– 200
,, Germany	14,000	15,000	+ 1,000
,, Italy	8,000	8,000	—
,, Switzerland	700	—	– 700
,, United States ...	3,000	5,000	+ 2,000
Electric cables, insulated—			
Total	40,000	51,000	+ 11,000
From Great Britain ...	1,500	3,250	+ 1,750
,, Belgium	5,000	9,000	+ 4,000
,, France	8,000	12,000	+ 4,000
,, Germany	12,000	17,000	+ 5,000
,, Italy	7,000	6,000	– 1,000
Electric wire and cable, armoured—			
Total	69,000	40,000	– 29,000
From United Kingdom ...	3,000	4,000	+ 1,000
,, Belgium	11,000	4,000	– 7,000
,, France	27,000	16,000	– 11,000
,, Germany	16,000	15,000	– 1,000
,, Italy	11,000	2,000	– 9,000
Uninsulated electric copper wire—			
Total	55,000	15,000	– 40,000
From Great Britain ...	16,000	1,000	– 15,000
,, France	25,000	11,000	– 14,000
,, Germany	12,000	1,000	– 11,000
,, United States ...	1,000	—	– 1,000
Electric light fittings—			
Total	70,000	69,000	– 1,000
From Great Britain ...	4,500	6,700	+ 2,200
,, Belgium	2,000	4,000	+ 2,000
,, France	14,000	17,000	+ 3,000
,, Germany	34,000	24,000	– 10,000
,, Italy	5,000	6,000	+ 1,000
,, Switzerland	4,000	4,000	—
,, United States ...	3,000	4,000	+ 1,000

£E=£1 0s. 6½d.

* Not specified.

† See next 3 items.

Electricity Supply in Great Britain.

Fuel Consumption Returns for 1925-26.

THE summarised monthly returns made to the Electricity Commissioners were published last week (H.M. Stationery Office, price 1s. 6d. net), and on this occasion the Return contains a complete alphabetical list of all the generating stations from which records were received, and in most cases a summary of the technical results of working, though in some instances the latter are not available for publication. The returns relate to 584 stations.

The lowest fuel consumption recorded was at Barton (Manchester Corporation), namely, 1.36 lb.; the output was 269,036,130 kWh generated, thermal efficiency 21.51 per cent., maximum load 74,790 kW, and load factor 41.0 per cent.

North Tees station (North-East Coast companies) came next with 1.51 lb., the output being 167,194,850 kWh, with a maximum load of 40,500 kW, and a load factor of 47.1 per cent. The thermal efficiency was 18.75 per cent. Carville produced 250 million kWh for 1.69 lb. per unit, at an efficiency of 18.95 per cent., the maximum load being 54,000 kW and the load factor 52.9 per cent.

The Radcliffe station of the Lancashire Electric Power Co. generated 131,315,948 kWh for 1.67 lb. per unit, with an efficiency of 17.45 per cent. and a load factor of 31.8 per cent. Other stations which used less than 2 lb. per kWh were Grove Road (Central Electric Supply, Ltd.) 1.81, Mersey Power Co. 1.81, Dalmarnock (Glasgow Corporation) 1.85, Valley Road (Bradford Corporation) 1.85, Whitebirk (Blackburn Corporation) 1.91, Bow (Charing Cross Co.) 1.91, Thornhill (Yorkshire Electric Power Co.) 1.91, Dunston (North-East Coast) 1.92, Clyde's Mill (Clyde Valley Electrical Power Co.) 1.96, Prince Rock (Plymouth Corporation) 1.96, and Prince of Wales (Rotherham Corporation) 1.98 lb. per kWh.

The average consumption of five stations in Class A (over 200 million kWh per annum) producing 1,241 million kWh, was 1.89 lb. coal per kWh. Nine stations in Class B (from 100 to 200 million kWh) produced 1,355 million units, with an average consumption of 2.11 lb., and 32 stations in Class C (50 to 100 millions) produced 2,237 million kWh, with a consumption of 2.21 lb. These 46 stations therefore generated 4,833 million kWh, at an average consumption of 2.1 lb. per kWh; the aggregate output of all the steam stations was 7,804 million kWh, with an average consumption of 2.4 lb.

Of the oil-driven stations, the lowest consumption was recorded by the Bognor Gas Light and Coke Co., and Felixstowe (East Anglian Electric Supply Co.), 0.64 lb. per kWh. Both stations had, roughly, 600,000 kWh output, a thermal efficiency of 27½, and load factors of 17 to 19 per cent. The aggregate output of 101 oil-driven stations was 45½ million kWh, at an average consumption of 1.05 lb. per kWh.

The only gas power station in Group G is that of Guernsey, which produced over three million kWh with a consumption of 1.61 lb. of coal, and a thermal efficiency of 17.23 per cent. Nine stations in Groups H and I generated 8.3 million kWh, with an average consumption of 3.1 lb., but the lowest consumption was recorded at the Littlehampton station of the Sussex Electricity Supply Co., Ltd., namely, 1.48 lb. The total output of 57 gas-producer stations was 20½ million kWh, and the average consumption 2.60 lb. of coal.

Metal-Clad Draw-out Switchgear.

A comparison of the horizontal and vertical types.

By THOMAS CARTER, M. Inst. C.E., M.I.E.E., Fel. A.I.E.E.

I HAVE had an opportunity lately of examining the question of metal-clad draw-out switchgear from the point of view of comparing the horizontal with the vertical types, to see if there is really any such inherent advantage of either type over the other as various manufacturers assert there is. Whether the conclusions I have come to are sound may be a matter of opinion: I have no doubt about them. It appears to me that the subject is one that should be looked at very broadly, because it has in some respects an international bearing, and is not merely something for one maker to outdo another in by devising a variation in design with the object of having something different to talk about. What I mean is that metal-clad switchgear is the result of intense British thought and concentration on an ideal (the word is not too strong, as those who know even a few of the facts are aware)—the ideal of making British standard switchgear a pattern for the world to follow.

It is well known that the originators of the metal-clad draw-out type refused to be turned aside from their conviction that this was the right thing, to be pushed day after day through thick and thin until it went home everywhere; and in the end their view prevailed, and people at home and abroad realised that they could not afford to be without this good aid to security in operation. Many manufacturers, in this country and out of it, now make metal-clad draw-out switchgear, and the vertical type, which was made on a very small scale many years ago, has recently cropped up again. Claims have been made for it as though it were on a level in merit with the horizontal type: these claims appear to me to be unjustifiable. I am thinking of the vertical type in which the draw-out is downwards; there is a large vertical type in which the draw-out is upwards, and special needs have led to the development of that type to fulfil a particular purpose. It does not enter, therefore, into the present discussion, which relates to gear of small and moderately large sizes only. What must be most carefully safeguarded is that metal-clad draw-out switchgear of any type made by a British manufacturer shall continue to be, as it certainly has been, in advance of gear made anywhere else; and it is thus essential that British practice shall be founded on a desire to give the world (including, of course, Britain itself) the type that from the most unbiassed point of view can be said to be the best. While I cannot pretend that a statement of the conclusions of one person will settle the question once and for all, I venture to think that the expression of a carefully-arrived-at opinion, with some definite knowledge behind it, may at least provoke further thought on the subject, the great importance of which will not be disputed by anyone. I feel quite sure that when the advantages of one type are carefully weighed against those of the other, the horizontal will not only hold its own, but will be found to be really very much superior to the vertical in all important respects.

It seems to me that the horizontal type is the one that would naturally be chosen because it embodies an obviously superior mechanical principle, namely, that of pushing something along on the level, and so having to overcome friction only, instead of lifting or lowering its whole weight vertically. The horizontal type supports the moving parts on its framework in precisely the same way at every point during the whole range of their travel; the framework itself forms the guide for the movement; and the gear for effecting the withdrawal is, to my mind, much simpler in the horizontal type. We have, in fact, an example of the same kind of contrast when we compare a vehicle moving on the level on a simple pair of rails with a lift working in a vertical shaft where it has to be provided with all kinds of safety devices and special guides to keep it in the desired position while it is moving upwards or downwards, not to speak of a suspension strong enough to carry the whole weight, and yet capable of being itself moved in such a way as to communicate its motion to the whole mass of the moving parts. It is claimed that it is much easier to remove the circuit-breaker and the oil-tank, or the oil-tank alone, from the vertical than from the horizontal type of gear, because the movement in the latter is first horizontal and then vertical, as compared with only vertical movement in the former. There is really much less in this than might appear, the fact being that, at any rate when a number of units are combined into a whole switchboard, a horizontal motion is required after the vertical lowering in the vertical gear if the part removed is to be taken out into the passage-way. Since, therefore, motion in two planes is necessary with both kinds of gear, neither of them is markedly superior to the other in this respect; but, if there is anything in it, the horizontal type seems to me to have the advantage in that the part to be removed is clearer of the rest of the gear if it is first racked out horizontally than if it is first lowered vertically, because it is then more accessible, and easier to place on a truck for removal.

The shape of horizontal gear, and the relative disposition of its several parts, are such that they quite clearly suit the convenience and promote the comfort of the people attending to it much better than vertical gear does. It is very much easier to stand and inspect horizontal orifices at approximately the ordinary level of the eyes than to put oneself into the rather contorted position necessary when vertical orifices have to be looked into; switchgear, in a word, should be made for man, and man ought not to be expected to have been made for switchgear. Again, when alternative busbars are provided, and the simplest method, namely, the plug method, of changing from one to the other is in use, the ease and rapidity with which a change-over can be made in horizontal gear certainly tell in favour of that type. Another point in its favour also is that should a complete circuit-breaker have to be exchanged, the process, for reasons already stated, is simpler in horizontal than in vertical gear, and is probably rather quicker too, because racking out and racking in are more rapid operations than lowering and raising.

The removable parts of horizontal gear, being always supported on permanently fixed structures, are easily pushed home to their full-in position, and equally easily locked there. Vertical gear, on the other hand, is more complicated in this respect, because the movable parts must have their weight taken on hangers of some kind, and these have obviously to be removed or got out of the way somehow before the gear is lowered, and must be replaced securely when the movable parts are put into their working position again. A further great advantage of horizontal gear is that when its movable parts are in the withdrawn position, and the tank is lowered away, it is possible to inspect all the

working parts adequately, just because they are well away from the rest of the gear, whereas the corresponding parts of vertical gear are no further away when they are withdrawn than when they are in the working position, and thus the rear parts cannot be made as fully visible. The operating mechanism of horizontal gear is very accessible, and although it certainly sticks out a little beyond the front of the main part of the gear, the projection is a very small one, and the convenient position of the mechanism far more than compensates for the slight amount of additional room required. The cable box is ordinarily mounted near the top of vertical gear, and is usually in such a position that it is less accessible when the movable parts are withdrawn than the cable box of horizontal gear, which takes a natural place underneath, and so is snugly housed and yet quite easily got at when necessary.

It has already been mentioned, but is worth mentioning again while the question of space required is being dealt with, that horizontal as well as vertical motion takes place during the process of completely removing either a vertical or a horizontal tank or circuit-breaker. It is therefore clear that a certain width of passage-way is required for each type, and the advantage claimed for vertical gear, that space is saved in this respect, is really largely illusory. Again, now that there is a growing tendency to use basements for housing switchgear in, the amount of headroom required is becoming exceedingly important, because it is so much more costly to provide by excavation than sideroom, and under these conditions the smaller height of horizontal gear gives it an advantage over vertical gear, already great, and likely to increase.

If a short-circuit occurs in a large supply system, while both the vertical and the horizontal types of switchgear are ordinarily robust enough not to be strained, the stresses set up are occasionally so great that some parts are damaged. The disposition of the internal conductors in vertical gear is such that any occasional fault so bad as to lead to a wholly abnormal strain may quite easily do considerable damage to the bus-bars, because they are situated directly above the circuit-breaker and its tank, and the mechanical displacement resulting from the fault is reasonably certain to be an upwards one, and to do damage in an upwards direction. In the horizontal type, on the other hand, the part of the gear likely to move when the circuit-breaker is strained is well in front of the bus-bars; any displacement in a vertical direction will simply raise it more or less from its mechanical supports; and no possible risk of damage to the bus-bars can arise from such a movement. This is so important from the point of view of continuity of supply that it makes it one of the great advantages of horizontal gear over vertical that in the event of a short-circuit violent enough to strain the circuit-breaker unduly, and so, consequently, to damage the bus-bars of vertical gear, the bus-bars of horizontal gear will remain quite unaffected. Bus-bars are so vital a nerve-centre of any supply system that if they are damaged no one can tell how serious the consequences may be; they must be preserved in security, therefore, at all costs; and it is just because horizontal gear is in the last resort slightly flexible mechanically, in such a way as to confine whatever damage may be done to a part less vital than the bus-bars, that it is so undoubtedly superior to vertical gear in this essential particular. Accidents in horizontal gear, resulting in the putting out of commission of an individual unit, obviously cannot interrupt more of the supply than the part that was controlled by that unit, whereas the much more probable destruction of bus-bars in vertical gear, arising out of, say, the explosion of a tank, may cause wholesale interruption.

Duplicate systems of bus-bars are required in many switchgear equipments, and I do not think it is seriously questioned that the horizontal type is much more suitable than the vertical for the two undoubtedly simplest methods of selecting alternative bus-bars, namely, those using either removable plug contacts or oil-immersed change-over switches mounted in the hoods, in which there is ample room for them. A third method of selecting alternative bus-bars is to have complete duplicate circuit-breakers. These may be quite satisfactory if they are entirely separate, and each has its own tank, but even then elaborate interlocks are required to prevent the closing of both circuit-breakers together, and the gear is thus made more complicated, even under the best conditions, when this method is used. Owing to the ease with which the simpler selecting appliances can be mounted, the standard tendency is to use one or the other of these in gear of the horizontal type. The difficulty of applying them to vertical gear, for lack of room, leads to the more frequent adoption of the double circuit-breaker; and the necessity for keeping the overall size small has actually caused some makes to be designed with both the circuit-breakers in one common tank. The futility of this as a means of achieving anything except increased damage in a breakdown will be realised after a very little thought. There is the greatest possible danger, if a fault should occur, that the trouble may spread in the tank to the contacts of the circuit-breaker nominally out of commission, and may thus actually involve both sets of bus-bars, even when only one circuit-breaker has been mechanically closed. It seems to be beyond doubt, therefore, that the horizontal type of switchgear is quite definitely better than the vertical in respect of facilities for the selection of alternative bus-bars.

The last point I want to refer to is concerned with weather-proofness. At first sight, it might appear that the vertical direction of the orifices in vertical gear would make that type much less likely to suffer from dripping water than the horizontal type, with its horizontal orifices; and, so far as that comparatively simple point matters, it is true that a vertical shield is in itself more directly rainproof than a horizontal shield. There is, however, far more than that to be taken into account. It is, incidentally, not difficult to make a weather-proof and rain-tight joint between the fixed and the moving parts of horizontal gear; but the real point is that the ordinary humidity of the atmosphere and sweating are sources of much greater danger than dripping water ever is, and the care that has to be taken in making horizontal gear water-tight is also effective in making it thoroughly proof against insidious damp from any source. The need to protect insulating surfaces against this real danger makes it equally essential to provide complete water-tightness and damp-proofness in both kinds of gear, and unless this is seen to in vertical gear (for example, by immersing the isolating contacts in oil and avoiding the use of air as an insulator, the possibility of doing which is in truth practically the only inherent virtue of the kind of vertical gear we are considering), any idea that it has an advantage over horizontal gear in this respect is an entire fallacy. Indeed, the very fact that a vertical orifice looks safer may result in the giving of less care to the joints on the assumption that drip-proofness is all that is required, and thus a false sense of safety may be created.

If I have succeeded in expressing myself as I have wanted to do, I will have made it clear that the balance of advantage lies with the horizontal type for small and moderately large units. This is a matter in which experience counts enormously; and I am, therefore, encouraged to believe that my conclusion is sound by the fact that the manufacturers who have been making metal-clad switchgear for by far the greatest number of years still stick closely to their original horizontal type in the sizes for which it is obviously the most suitable. There are many sufficient proofs that this is not due to mere narrow conservatism, and my own view is that it clinches the argument in a way that brings one unavoidably to the conclusion that the interests of switchgear users (here I get back to the international point of view) will be best served if British manufacturers concentrate on still further perfecting horizontal-type switchgear, which has already done so much to establish a prestige for them in all parts of the world.

Electricity Tariffs.

A special two-part tariff in combination with an automatically-operating peak meter-switch device, introduced by the South Swedish Power Co., which has proved very successful in stimulating the domestic use of electricity for heating purposes, &c., during "off-peak" periods.

By ALFRED EKSTRÖM, Sc.D.

FOR the encouragement of the use of electricity on as large a scale and over as large an area as possible, a low price of energy is a *sine-qua-non*.

The bulk of the cost of the production and transmission of electrical energy is a fixed charge; the variable charge, that in proportion to the kWh sold, is only a fraction of 1d. per kWh. Therefore the more thoroughly the plant can be utilised, the greater will be the number of kWh upon which the fixed charge can be distributed; thus the problem involves not only the framing of tariffs, but also the stimulation of fresh demands for electricity and the introduction of suitable metering devices.

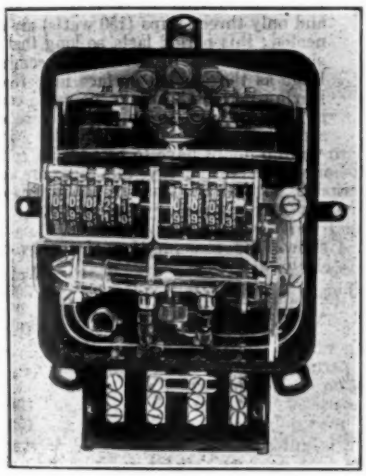


Fig. 1.—Peak Meter without Cover.

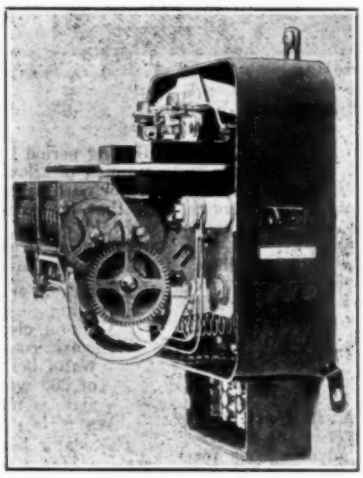


Fig. 2.—Side View of "Subtraction" Meter.

Fixed Annual Price per Kilowatt.

In Norway a certain number of kilowatts per annum has hitherto generally been contracted for. In Oslo, for example, a subscriber pays £10 per kilowatt per year, and is then able to make use of it for as many hours as he wishes. For measuring, simple "current limiters" are used which, so soon as the amount of power subscribed for is exceeded, periodically disconnect the supply, alternately extinguishing and switching on the lamps. This tariff presupposes a supply of cheap water-power; even in Norway, however, a commencement has been made to depart from this system, as it not only encourages a waste of energy (it is considered that about 40 per cent. is wasted through the subscribers not having any economic interest in saving energy), but also possesses many drawbacks.

A Purely Kilowatt-hour Price.

In Sweden a certain price is charged per kilowatt-hour to a large extent: in many places a higher price is charged for lighting than for motor power, special meters being used for the different purposes; in other places a higher price is charged during the lighting periods than during the rest of the day, in which case only one meter is necessary, but it must be fitted with two registering devices for measuring the current according to both the high and low tariffs, as well as a clock, which (as a rule monthly, according to daylight conditions) resets the periods during which the energy consumed shall be registered at the one or the other tariff.

In Switzerland there has even been introduced a third tariff for stimulating the night consumption of energy. Multiple-tariff meters, however, are not quite reliable, and also entail a great deal of work on account of the monthly re-settings, for which reason these tariffs are not very popular.

The Two-Part Tariff.

So far as only large consumers of electricity are concerned, this form of tariff may be considered satisfactory. For small consumers, such as agriculturists, households, and handicraft, however, such a tariff is inappropriate. They will probably be far from anxious to make a purely temporarily occurring maximum load the basis for the calculation of an appreciable portion of the energy cost; further, the electricity meters necessary for this purpose are far too expensive to make them suitable for small consumers of energy. For this reason other methods of calculation have to be made the basis for the fixed charge. In agricultural cases the number of hectares of arable land is therefore often used as a basis for this purpose; in the case of dwellings the number of lamps fitted, or the number of rooms, &c., being the criterion. A medium fixed charge in Sweden is 11 shillings per hectare, and for non-agriculturists two lamps are generally taxed similarly to one hectare.

The variable charge has hitherto generally been a purely kilowatt-hour charge. In order to encourage the use of energy during non-lighting time double-tariff meters with a low kilowatt-hour charge have frequently been retained, but if this is to achieve any success, the charge must be exceedingly low. Such a tariff is nevertheless not without its risk: in America, for example, such cases have revealed the surprising fact that on every Sunday morning so many people used electricity for heating their bath water that there were difficulties in the transmission of power.

The Peak-Meter System.

Of late, however, a peak-meter system has been introduced in Sweden which, to judge from all appearances, will assume great importance as regards the use of electricity in the home. This tariff is based upon the fact that the energy subscribed for can be divided (i) partly into a certain optional load, for which the fixed annual charge is made per kilowatt per year, no matter how many hours the subscriber makes use of it, and (ii) partly into the energy consumed *beyond* that load,

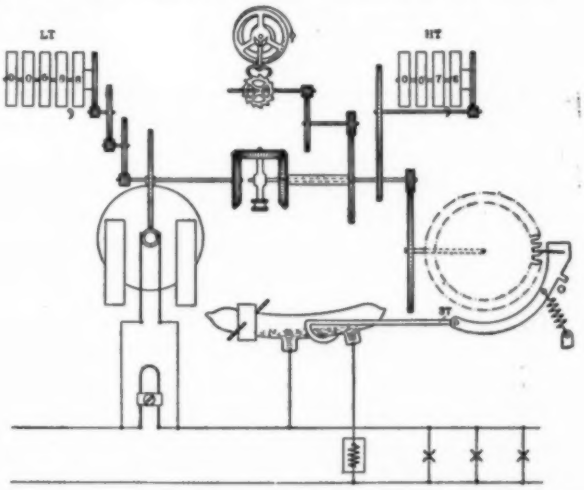


Fig. 3.—Diagrammatic Representation of Ericsson Meter and Switch.

for which a certain charge is made for each kilowatt-hour consumed. The energy consumed *below* the optionally-limited load is called *basis energy;* that consumed *over and above* the former is called *supplementary energy*. The basis energy is paid for, by way of example, at the rate of £14 per kW per year, and the supplementary energy at the rate of 1½d. per kWh. As experience has shown that a longer period of use of the basis energy than 7,000 hours per year is never reached, £14 per kW therefore corresponds to a price of at most ½d. per kWh. The choice of such a tariff depends upon the availability of a comparatively simple and reliable so-called " subtraction " or peak meter. The City of Stockholm

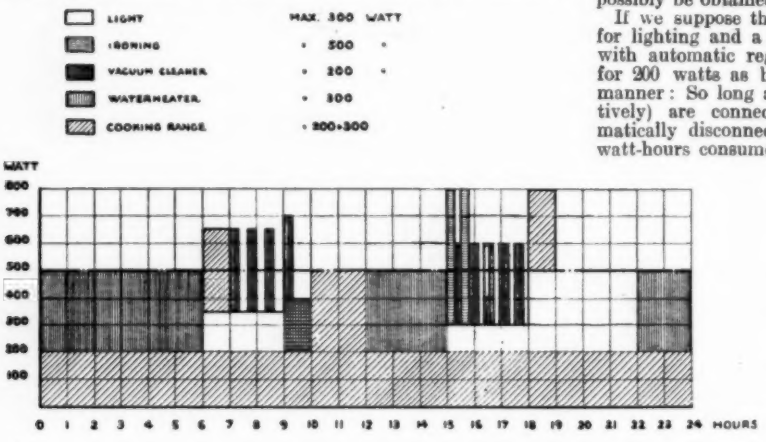


Fig. 4.—Load Curve, Lighting and Domestic Apparatus.

electricity works have designed an excellent meter of this kind (figs. 1, 2 and 3), which measures and registers *both* those kilowatt-hours consumed below a certain optionally-adjustable load (the so-called *basis load*) and also those kilowatt-hours consumed over and above that load (the so-called *supplementary energy*). This meter is manufactured by the L. M. Ericsson Company, and it might be considerably simplified if only the kilowatt-hours consumed as excess energy were to be measured, for it is really unnecessary to measure the kilowatt-hours consumed as basis energy, inasmuch as a fixed charge per kilowatt per year is made for it, no matter how many hours in the course of the year it is utilised.

The meter is combined with an automatic connecting and disconnecting device, by means of which the basis energy can be automatically rigorously utilised when it is not used, for instance, for lighting or by other devices. The electric water heater for family use is especially advantageous for such a purpose, enabling the electrical energy to be stored in the form of heat whenever it is not used by other devices which have priority in the utilisation of the basis load. It is desired to emphasise the advantage of the bulk of the power subscribed for being consumed as basis energy at the comparatively low price, whilst the subscriber is entitled at any moment whatsoever to exceed this on payment of the higher price for energy consumed on such occasions. This is also a great advantage for the consumer, as compared with the current-limiters employed in Norway, which do not permit of a temporary use of a higher load than that for which one has subscribed. In so far as the price of basis energy is reduced as mentioned* above, the use of electrical energy for heating water in households and farm dairies becomes important. How essential the price for basis load in this connection is becomes apparent from the following examples:

Examples of " Subtraction " Meter Operation.

Lighting and Water Heating.—Assume the sale to various subscribers of basis energy at £17, £14, or £12, respectively, and excess energy at the rate of 1½d. per kWh; the maximum consumption for lighting has been found to be about 50 watts for each person, with an annual period of use of 800 hours. If by means of suitable automatically-regulatable apparatus, such as the above-mentioned L. M. Ericsson meter, a hot-water tank is automatically connected in circuit so soon as the maximum amount ceases to be consumed, it will probably be possible with advantage also during some days in December and January, when lighting is most called upon, to utilise for the heating of water an average of 50 watts for about 18 hours per day, or 0.050 by 18=0.9 kWh. For this from 7 to 8 litres of water could be heated from 10 to 90 deg. C. with an efficiency of 80 per cent. of the water heater.

The cost of lighting current would, if the maximum load consumed during 800 hours is consumed as excess energy, be $0.050 \times 800 \times 1\frac{1}{2}/100 = 5$s. per head. Furthermore, a fixed annual charge will have to be added; this, however, is levied only for the lighting subscription, not for water-heating, for which reason it can be omitted from the comparison.

Should, however, a water heater be connected which consumes electrical energy only so far as the maximum load is not used for lighting, and obtains from 7 to 8 litres of warm water per day for 300 days per annum, the energy-consumption for the heating of the water would be $300 \times 0.9 = 270$ kWh. With a basis price for power at the rate of £17, £14, or £12, respectively, the whole subscription for 0.050 kW would cost 17s., 14s., or 12s., respectively. If we still calculate the expense for lighting at 5s., then 12s., 9s., 7s., respectively, would be on account of water-heating, or about 0.5d., 0.4d., or 0.3d., respectively, per kWh.

Possibly it is only at the last-mentioned price that a fairly general use of electrical energy for heating water can be considered. To this price, however, must be added the cost of a water-heater and automatic switching apparatus with appurtenant meter. These may, when in general use, possibly be obtained for £8 for a family of five to six persons.

If we suppose that the family has fitted six 50-watt lamps for lighting and a water-heater of 200 watts, a meter fitted with automatic regulation (adjusted to a fixed subscription for 200 watts as basis load) would operate in the following manner: So long as 4 to 6 lamps (200 or 300 watts, respectively) are connected, the water-heater will remain automatically disconnected; the meter registers only those kilowatt-hours consumed by the lamps exceeding four in number. If, on the other hand, fewer than four lamps (*e.g.*, three lamps, or 150 watts) are connected, the water-heater will be disconnected or connected for periods of a couple of minutes' duration according to the diagram reproduced in fig. 5. During the first period both the water-heater (200 watts) and three lamps (150 watts) are connected, 350 watts being consumed. During the second period the water-heater (200 watts) is disconnected, and only three lamps (150 watts) are connected; this period lasts so long that the shaded surface in period 2 becomes as large as the shaded surface in period 1. During periods 3 and 4 the same course is repeated, and so on, the average consumption being thus only 200 watts. During period 1 there will no doubt have to be added a certain number of kilowatt-hours as excess energy, but these are again deducted during period 2, so that the final result in this case is that no excess energy is registered by the meter.

Lighting and Sundry Household Apparatus.—The diagram reproduced in fig. 4 shows the consumption of energy of a subscriber who uses electrical energy for—

	Watts.
Lighting, six 50-watt lamps, maximum	300
Ironing	500
Vacuum cleaner	200
Electric cooking range, one resistance-coil of 200 watts being permanently connected, and one of 300 watts on occasions when the cooking plate is made use of, maximum	500
Water heater, maximum	300

The water heater is automatically disconnected as soon as the load for other purposes exceeds the basis load subscribed for, for instance, of 500 watts, and is automatically switched in as soon as the load for other purposes is less than 500 watts. Fig. 4 shows that the 200-watt element of the range

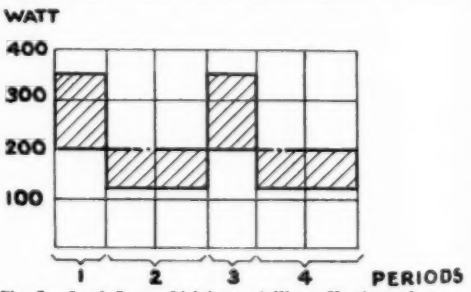


Fig. 5.—Load Curve, Lighting and Water Heating only.

is permanently connected during all the 24 hours of the day*; from midnight to 6 a.m. the water heater is also connected; the subscription for 500 watts is then fully utilised, and no excess energy is drawn upon.

From 6 to 7 a.m. there are, besides the 200 watts of the range, also connected three 50-watt lamps and the 300-watt cooking plate of the range; the whole subscription is made use of, and besides that excess energy of 150 watt-hours.

From 7 to 9 a.m., besides the 200 watts of the range and 150 watts for lighting, the water-heater is periodically connected, so that its average load during this time is 150 watts; the whole subscription is used, but no excess energy.

From 9 to 10 a.m. the 200 watts of the vacuum cleaner are continuously connected, besides the 200 watts of the range; the water-heater is periodically connected, so that its average load during this period is 100 watts; the whole subscription is used, but no excess energy.

From 10 a.m. to 12 (noon) the two resistance coils of the range (200 and 300 watts) are continuously connected; it is

*See ELEC. REV., September 17th, 1926, p. 473, for description of " Seves " cooker.

assumed that during this time luncheon is being cooked; the whole amount subscribed for is used, without any excess energy.

From 12 (noon) to 15 o'clock the water-heater is continuously connected, besides the 200 watts of the range; the whole subscription is used, without excess energy.

From 15 to 16 o'clock the flat iron of 500 watts is connected during two periods of 15 minutes each, besides the 200 watts for the range and 100 watts for lighting; besides this the water-heater has automatically been connected when the flat iron was disconnected; the whole amount subscribed for is used, and excess energy of 150 watt-hours.

From 16 to 18 o'clock, besides 200 watts of the range, there are connected 100 watts for lighting and periodically the water-heater, so that the average load of the latter during this time is 200 watts; the whole amount subscribed for is used, without excess energy.

From 18 to 19 o'clock there are connected the 300-watt coil of the range, as well as the 200-watt coil for the range, and 300 watts for lighting; the whole amount subscribed for is used, and, furthermore, excess energy of 300 watt-hours.

From 19 to 22 o'clock 300 watts for lighting are connected, besides the 200-watt coil for the range; the whole amount subscribed for is used, without excess energy.

From 22 to 24 o'clock 300 watts for the water-heater are continuously connected, besides the 200-watt coil of the range; the whole amount subscribed for is used, without excess energy.

Total amount of excess energy is 150+150+300=600 watt-hours. Besides the ¼ kW subscribed for as basis load, there is being used 0.6 kWh excess energy; assuming that this curve is repeated on 300 days, the cost for a family of six persons will be:—

Fixed charge for local distribution for six lamps at 5s. 6d. each	£1	1	1
500 watts at £11 per kW per year	£5	10	0
180 kWh at 1¼d.	£1	1	10
Total	£7	12	11

Therefore, for this price is obtained light from six 50-candle-power lamps, heating of about 40 litres of water to about 90 deg. C., as well as all the electrical energy required for cooking, vacuum cleaning, and ironing.

Selected Radio-Telephone Apparatus.

Recent Developments and Improvements.

A Large Hospital Receiver.

What is probably one of the largest receiving sets in England is to be installed in St. Giles' Hospital, Camberwell, London, and is on view at Messrs. Holdrons', Ltd., Peckham. It was made by the OXFORD WIRELESS TELEPHONY CO., LTD., and has been built into one container, not formed of a multiplicity of units, and is the one hundred and forty-second instrument turned out by this firm for use in British hospitals and institutions. There are 12 valves only, so arranged that the 1,100 pairs of headphones it is required to supply, never less than 550 at a time, are equally fed from the central source, and are arranged in banks which can be switched on or off at will by the authorities in charge of a particular ward, or group of rooms, but the set is capable of energising double the number of headphones in use, and there is therefore an ample reserve of power. In addition, the apparatus can deliver adequate volume to 50 loud-speakers, and a microphone attachment has also been fitted whereby a concert held in one of the rooms of the hospital will be heard throughout the wards, 2LO and Daventry being cut out. The control panel is so arranged that, once the set has been installed and adjusted, it will be necessary only to push a switch from its central position to a position marked "London" to switch on the entire equipment, no tuning adjustment being required; if the programme from Daventry is wished for, the same switch is pushed to a position marked with the name of that station, and again all tuning is completed by that action. The whole of the wiring is readily accessible by raising the glass-panelled lid; there are six separate and distinct headphone circuits, each one separately controlled at the set. "Bottom-band" rectification without reaction of any description is used, and inter-action is guarded against by the fact that all components which could cause the set to oscillate are enclosed in non-magnetic nickel screens. The whole of the cost of the instrument, together with that of the wiring of the hospital and the supplying of headphones, is being borne by voluntary subscription; at present over £500 has been raised, but £100 more is wanted to complete the work, one of the objects of exhibiting the set being to give the charitable minded an opportunity of contributing.

A D.C. Battery Eliminator.

A new product of MESSRS. PHILIPS LAMPS, LTD., is an anode battery eliminator for operation off d.c. domestic supply mains at from 200 to 250 volts. The output is regulated by two controls: one is marked "det," and provides 14 mA at a voltage variable from 20 to 60 V for the h.f. and detector valves, whilst the other is marked "volt," and furnishes 30 mA at 120 V, which is variable to about 40 V. The device is neat in appearance and, if the instructions are carefully followed, there should be little risk of short-circuiting the mains through the earth connection of the receiving set.

An "Individual-Gang" Condenser.

A major improvement in the "ganging" of condensers appears to have been achieved by MESSRS. ARTHUR PREEN AND CO., LTD., who have produced a "Formo" triple-gang condenser which operates on a new principle. It consists of three condensers, each having the usual rated capacity of .0005 mfd., but instead of being mounted with their axes in alignment the condensers are mounted side by side. Each separate condenser is provided with its own dial; the centre dial will, however, operate the three condensers simultaneously, and all three are "ganged" together by an ingenious arrangement of two moulded bars, each condenser spindle being attached to these by means of a specially shaped metal bracket; by means of a friction arrangement either of the two outer condensers may be adjusted independently of the others so that any variation in the tuning of its circuit may be counteracted by altering its own dial. Mounting the new instrument is simplified by the provision of a template and special bolt; if a centre hole be drilled to accommodate the spindle of the centre condenser, the bolt may be used to clamp the template to the panel so that the outer holes for the other two spindles may be drilled correctly. The new condenser should considerably simplify the tuning operation, the aim of the design being to overcome the difficulty of the condensers "falling out of step" at some part of the range.

"Hunt" Specialities.

MESSRS. A. H. HUNT, LTD., have secured the sole selling rights for the United Kingdom of the range of hydrometers produced by the ALA Manufacturing Co., of Chicago, U.S.A. They are made in a variety of types to meet different requirements, the sample sent us (fig. 1) having been designed for radio purposes; the substantial rubber bulb is fitted with a perforated stopper, whilst a perforated hard-rubber nozzle plugs the lower end of the glass barrel, acid being drawn up into the latter through the extension tube, which can be inserted into quite small cells. The float contained inside the glass barrel is moulded, which process is claimed to result in a stronger and more accurate article than the hand-blown variety. The "B" pattern illustrated is 10.5 in. long and its bore is 9/16th in.; it is well made, and sold at a modest price.

Fig. 1.—The 'ALA' Hydrometer.

When rooms are being wired for loud-speaker extension Hunt wall jacks can be conveniently incorporated to provide definite contact. Following the usual design, the jack is mounted on a small erinoid panel only ¾ in. wide so that the device can be unobtrusively fitted; contact points are more widely spaced than usual to increase insulation, and it will accommodate any standard plug, the total projection being 1 in. only sideways; a nickel-plated cover is provided.

A Thermo-electric Generator.

We are informed by MESSRS. ATTAIX, LTD., that they are placing an instrument on the market which they claim will enable users of receiving sets to dispense with accumulators, whether they have electricity in their houses or not. A compound of metals is employed to produce electricity when heated, either electrically or otherwise, and the generator is to be made in 2-, 4- and 6-volt types: its output is said to be from 0.3 to 0.6 ampere and the instrument begins to function at 100 deg. F.

New Marconi-Osram Valves.

We have received samples from the MARCONIPHONE CO., LTD., and the GENERAL ELECTRIC CO., LTD., of their recently-marketed 2-volt, 0.1-amp. filament valves. The DEH.210 type is a high-magnification pattern suitable for resistance-capacity coupled l.f. amplifiers, or as a detector followed by an r.c. stage, but may also be used in h.f. stages when some form of stabilising device is employed. Its amplification factor is 35 and it has an impedance of 75,000 ohms, which, for a valve of such small filament wattage, gives a "steep slope"; high amplification per stage will be obtained by the use of an anode resistance of ¼ megohm and applying 150 volts to the plate with grid negative bias of 1½ volts.

The type DEL.210 general purpose valve, when transformer coupled in an l.f. stage, needs 120 anode volts with 6-V negative grid bias to operate a loud-speaker at medium strength. Its amplification factor is 9 and impedance 17,000 ohms. Its 120-volt curve is perfectly straight for almost its entire length, and the bottom bend is so short and slight that it is almost included between minus 12 and minus 14 grid volts in a horizontal direction and between zero and 5 milliamperes in a vertical direction.

A New "Ediswan" Valve.

The EDISON SWAN ELECTRIC CO., LTD., has sent us a sample of its latest valve, the RC.610, which is intended for resistance-capacity coupling. Of the 6-volt 0.1-A filament type, it has a lower impedance (100,000 ohms) than the RC.2, with a consequently higher amplification factor of 40. Its filament is longer and anode of larger area; the anode voltage is 120 V and the slope 0.4 mA per V. The correct power valve to use in combination with it is the PV.5.

The "Electrolux" Refrigerator.

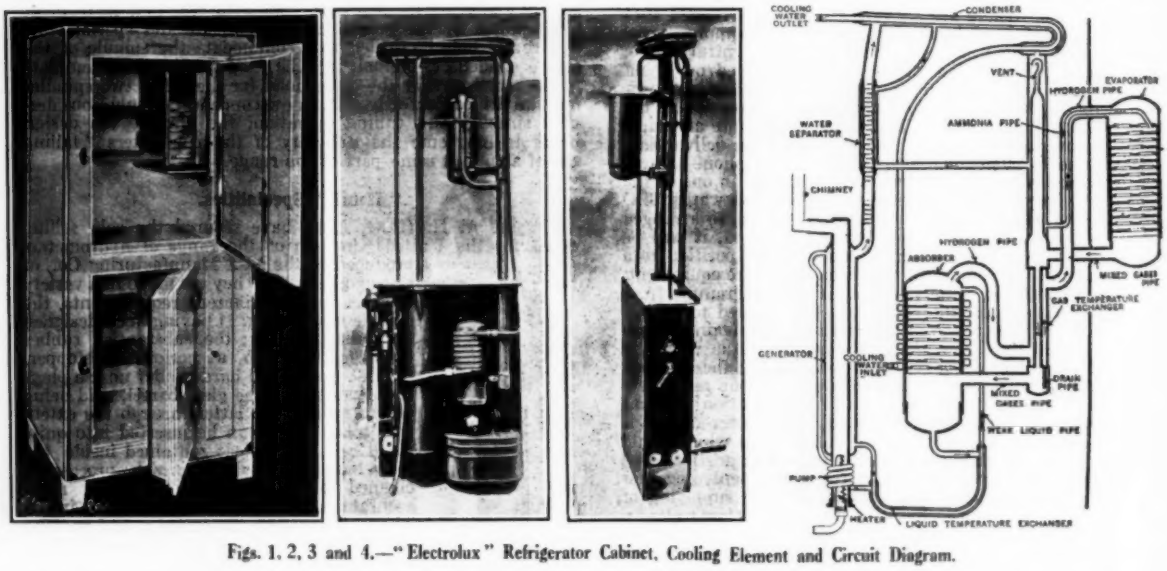
Some Noteworthy Modifications in its Design.

SINCE we previously described the Platen-Munters system* the refrigerator has been modified in several respects, consequently improving its efficiency of operation. It is, of course, important that the water vapour contained in the ammonia gas as it leaves the generator should be removed before the gas reaches the condenser. For this purpose a water separator has been incorporated (see fig. 4): as the gas and water vapour leave the boiling liquid they are at a comparatively high temperature, and the water is removed partly by the effect of the baffle plates within, and finally by the cooling effect of the ammonia in the annular space around, the separator. The warm gas passing through the separator (raising the temperature of the ammonia liquid in the annular space a few degrees) causes this liquid to evaporate, the gas so formed passing straight back into the condenser where it is again cooled and recondensed. No further rise of temperature of the liquid ammonia takes place, the liquid being thus kept at a constant temperature by its own evaporation. The inner wall of the annular chamber thus forms a surface at a fixed temperature for pre-cooling the ammonia gas and so purifying it before it enters the condenser; the water thus condensed drips back over the baffle plates and finally falls into the generator. It will be realised that only so much of the liquid ammonia as is necessary for depriving the gas of its water-vapour content passes into the separator, the balance passing into the evaporator. This device is a material improvement on the previously used air-cooled radiator which it has displaced; consequently more heat can be applied to the generator, which fact has led to the addition of a switch for 3-heat control. Further, a safety switch, in the form of a tilting glass tube containing mercury, is now employed to interrupt the heating circuit in the event of the failure of the flow of cooling water.

* See ELEC. REV., February 26th, 1926, p. 327.

Another modification is the incorporation of a gas-temperature exchanger, through the central tube of which the intensely cold mixed gases from the evaporator pass; the temperature of the warm hydrogen gas from the absorber is thereby lowered before it enters the evaporator. The exchange of heat therefore results in an increase of the cooling effect, otherwise the hydrogen entering the evaporator would be comparatively warm, and the evaporating ammonia would have to cool this gas in addition to cooling the cabinet; in other words, the "coldness" in the mixed gases which would otherwise be wasted is transferred to the pure hydrogen. The object of the vent pipe which is shown in the interior of the vertical tube connected to the lowest part of the condenser is to provide a direct passage to the absorber, through which any hydrogen gas which may have found its way into the condenser can pass. When the apparatus is not in use, it is possible that some hydrogen may find its way into the condenser, where it would be detrimental to the working of the apparatus: as soon as heat is applied to the generator, ammonia gas flows into the condenser, driving the hydrogen gas down the vent pipe into the absorber or evaporator. The pipe is bent down to prevent any possibility of the liquid ammonia from the condenser falling down it.

It should also be explained that all steel pipes which are liable to corrosion are now provided with an inner tube of copper. Moreover, the evaporator is no longer encased in a brine tank, which has been eliminated. In its stead an aluminium casting (not shown in the diagram), having fins like a radiator, is fixed around the evaporator so that it also is cooled to a similarly low temperature, the icy cold surface of the aluminium fins, in turn, cooling the air in the cabinet. The latter is of all-metal construction, with the exception of wooden inner door frames, white enamelled outside and in, the interior surfaces being porcelain enamelled.



Figs. 1, 2, 3 and 4.—"Electrolux" Refrigerator Cabinet, Cooling Element and Circuit Diagram.

The Works at Luton.

On Wednesday, May 18th, the works of Electrolux, Ltd., at Luton, were visited by a large company of ladies and gentlemen connected with the electrical industry and the newspaper and trade Press, the occasion being their formal opening by Sir Robert Horne, K.C., M.P. The various departments of the works where the "Electrolux" vacuum cleaners are being turned out at the rate of 1,200 or 1,300 per week, and electrical refrigerators in considerable and increasing numbers, were inspected from the receipt of stores and parts to the assembling, welding, porcelaining, testing, and other processes, and the packing of the finished article ready for dispatch. The factory buildings cover an area of 200,000 square feet with considerable extensions in prospect; 200 additional acres have been acquired and workmen's cottages will form a model Electrolux village, while canteen, tennis, and other welfare and sports facilities have been provided; it is even stated that a bonus system has been introduced for the employés. It is understood that since the inauguration of the company at the Savoy Hotel, London, over a year ago, 1,200 additional persons have been employed either at the works, or on the road in selling activities. At the function last week, Major H. A. Wernher, the chairman, referred to the large orders that the company and its Swedish associates had placed for British raw materials to be used in the production of their refrigerators here and on the Continent. The present output of refrigerators and cleaners was far short of what it eventually would be. The new works started a new British industry and their equipment included British plant made to special specifications. Sir Robert Horne, the Mayor of Luton, and the Member of Parliament for Luton, followed. The cheapness of electricity at Luton as an inducement to such companies to start manufacturing operations in the area, was frequently alluded to.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

The County of London Bill.

As briefly mentioned in our last issue, the Bill promoted by the County of London Electric Supply Co., Ltd., principally to confer powers with regard to the county of Essex, was passed by a committee of the House of Commons on May 17th A short report of the last two days' proceedings follows:—

On May 16th Mr. R. BURY, for the Essex County Council, asked that the Bill should be rejected as no definite scheme had been put forward by the promoters. The company should be made to proceed by means of a Special Order, for if the Bill were passed other authorities would be unable to develop the area, although their extension might be desirable. When the Central Electricity Board had prepared a scheme, the company might be allowed to bring forward a Bill. Alderman H. E. BROOKS (Essex County Council) said that all the large towns in the county proposed to supply large rural areas around their boundaries. If those orders were not granted the company should be asked to give guarantees. He could not agree that the clause allowing local authorities to apply for Special Orders after the passing of the Bill was effective, for the erection of generating stations was precluded.

Sir LYNDEN MACASSEY, K.C., for Southend Corporation, said his clients had decided to apply for a Special Order for an increased area of supply and to erect a power station at Canvey Island. The company should, therefore, not be given powers which would prejudice that application. Sir Harry Renwick had stated that the Bill was largely framed upon advice received from the Electricity Commissioners. Counsel deprecated that, and said that it would create grave misgivings in the minds of local authorities, who looked to the Commissioners to be impartial. Sir Lynden Macassey also said that Mr. Merz, the promoters' chief technical witness, had stated that his firm had prepared the schemes upon which the Central Board was proceeding. Moreover, Mr. Page, who was until recently general manager of the company, was now engineer to the Central Board, and would have been called to give evidence for the promoters if he had been in London. It might be that the Bill was promoted with advance knowledge of the Board's intentions. If that were so the local authorities had equal right to know what those intentions were. He argued that the correct procedure was by Special Order, which would receive the same attention as Orders applied for by local authorities. While maintaining that the Bill should be rejected, counsel asked that in the event of its being passed a clause should be inserted protecting the Southend Corporation from competition in the extended area applied for in its Special Order.

When the proceedings were resumed on May 17th the chairman announced that the Committee found the preamble of the Bill proved subject to the insertion of a clause providing that within 12 months of the passing of the Bill, and within each succeeding 12 months, the company should submit to the Electricity Commissioners proposals for giving a supply in all parts of the added area in which there was a demand and in which there were no authorised distributors. The proposals were to be carried out within two years of approval, or such period prescribed by the Commissioners, failing which the powers in such parts of the added area could be annulled. The time for the lodging of applications by local authorities was also extended to April 1st, 1927.

Mr. ROWAND HARKER, K.C. (for the company), referring to observations made the previous day by Sir Lynden Macassey, which had been reported, had been taken by the Commissioners to mean that the company was in some way attempting to detract from their jurisdiction and powers, and that the company could ignore them. Sir John Snell had interviewed Mr. Merz, and the latter would like to explain his position. With regard to Mr. Page, the Bill was ready before he left the company, but he took the view that it would not now be proper for him to give evidence for the company. Therefore, Mr. Merz, who was familiar with the company's work, was called upon instead. The chairman said that Mr. Harker had taken a proper course, and the Committee thought that nothing which had been done was in any way reprehensible. Later, Mr. HARKER, replying to a point raised by Sir Lynden Macassey, stated that there was a clause in the Bill giving local authorities power to purchase the parts of the undertaking in their areas. He also asked for a provision that when applications for Special Orders were made by local authorities the company should have the right to be heard. The chairman said that the Committee would agree to such a provision in connection with the applications of Southend, Colchester, and Clacton. Beyond that the decision already given must stand.

Subject to the insertion of clauses giving effect to the Committee's decisions, the Bill was then passed for third reading.

On May 19th, the Committee approved clauses which were submitted to give effect to its decision. The Lea Conservancy Board asked for the insertion of a clause giving it power to impose conditions with regard to the execution of work by the company upon its property, and providing for a reasonable payment to the Board in respect of wayleaves.

Mr. S. G. TURNER (for the company) contended that the matter was covered by the general law, but after discussion the Committee decided to insert the clause.

London and Home Counties Bill.

A committee of the House of Commons, presided over by Sir A. Shirley Benn, commenced the consideration of the London and Home Counties Joint Electricity Authority (No. 2) Bill on May 18th.

Mr. CRAIG HENDERSON, K.C., for the promoters, dealt with the circumstances leading up to the formation of the Joint Electricity Authority, and said that the object of the Bill was to secure power to erect a generating station at Duke's Meadows, Chiswick. The Brentford Gas Co. had twice endeavoured to secure the site for the erection of gasworks, but had not succeeded. The erection of a generating station, however, would not interfere with the amenities of the district. The Ministry of Health had expressed the opinion that the site should not be used unless the use of another site would raise the cost of electricity. Mr. J. H. Rider, the Authority's consulting engineer, had been unable to find another suitable site. The Authority had arranged to exchange a larger and better site for the one in question, and so the public would benefit. The London Power Co.'s opposition to the Bill was due to a fear that it would prejudice the company's application for powers to erect a station at Battersea, but the Authority's station was required to serve an area in which none of the constituents of the London Power Co. operated and there was room for both stations. The promoters had no desire to "side-track" the Electricity Commissioners; indeed, the latter had already said that the site was suitable, and in any case the equipment of the station would be under their control. If, however, the promoters proceeded under the Electricity Act of 1919 there would be further delay. Mr. Rider gave evidence for the Authority, and said that the estimate of the demand in the London Electricity District in 1925-26 was 441,795 kW, but the actual demand was 577,317 kW. He now estimated that the demand in 1930-31 would be 878,590 kW, and in 1935-36 1,179,920 kW. Mr. Rider dealt in some detail with the existing plant in the area, and said that the gradual shutting down of smaller plant would necessitate additional plant in a few stations. He recommended the retention of three primary and 20 secondary stations (out of the 62 existing), having a total capacity of 1,245,000 kW, the three primary stations being Deptford, Brimsdown, and Barking. The CHAIRMAN said that the Committee would be guided by the Electricity Commissioners' decision that a riverside station in the West of London was necessary, and would merely want to know which was the best site. Mr. RIDER said that, after thorough investigation, he had no doubt that the Chiswick site was the most suitable. It was proposed that the first section should have a capacity of 125,000 kW. On May 19th, he dealt very fully with the details of construction of the proposed station, and dwelt particularly upon the arrangements which would be made to prevent any nuisance arising from the combustion processes. He then gave particulars of the generating costs, and said that with a 40 per cent. load factor and coal at 20s. a ton, the total cost per kWh sent out would be 0.4315d. When the station was completed the cost would be reduced to 0.366d. per kWh, and the total capital cost would be 4¼ millions sterling, or £13.9 per kW. At the end of seven years, he said, the Authority would be called upon to supply

64,590 kW of the total demand of 112,590 kW, not taking into account any supplies which might be required by the North Metropolitan Company or the Central Electricity Board. Questions were put by Mr. Wrottesley, K.C., for the Barnes Urban District Council, suggesting that the smoke from the station would be a nuisance, but Mr. Rider said that a thoroughly modern station would not offend in that respect. The Committee adjourned until May 24th.

East Anglian Electricity Bill.

When the Committee of the House of Commons, presided over by Sir Arthur Shirley Benn, met again on Thursday, May 19th, Mr. Craig Henderson, K.C., mentioned the steps which had been taken to meet the Committee's requirements. He stated that a resolution had been passed by the board of the company to the effect that the capital would be increased by £150,000 with the sanction of the shareholders, and there was little doubt that this sanction would be obtained. Counsel also produced a draft contract between the East Anglian Co. and the Greater London and Counties Trust by which the Trust agreed to subscribe the whole of the additional £150,000, at the same time undertaking to subscribe or procure additional capital to the extent of £500,000, as and when called upon by the company. Moreover, the Trust agreed to exchange its debenture holding in the company for ordinary shares. After the Bill had been approved by the Committee the contract would be produced in its executed form. With regard to another suggestion by the Committee, counsel produced clauses providing that the company should, within one year from the passing of the Act, and at such other times at intervals of not less than three years as it might be required to do by the Electricity Commissioners, submit proposals for the supply of electricity in those parts of the area where there was a demand for electricity and there was a reasonable prospect of the supply being remunerative. It provided that the question of the existence of a demand in any area should be determined by the Commissioners. Further, the clause provided that in submitting the first proposals the company should submit a general statement of further proposals for the ultimate development of the whole area at a cost of not less than £500,000.

The Chairman said that the Committee would consider the proposals, but it occurred to him that in such a rural area there was hardly a place where supply would be remunerative at first. The Committee wished to see that the area was provided with transmission lines whether the districts through which the lines passed were remunerative or not.

Mr. Craig Henderson said that until the promoters knew what the national scheme was going to be it would be impossible to draw up a scheme of transmission lines of a definite character.

The Chairman then asked for some evidence as to the financial standing of the Trust. Mr. F. M. Rogers, chairman of the Trust and also of the company, said that there was cash available at present to provide the £150,000 new capital, and there was no doubt whatever that the £500,000 would be forthcoming as and when required. He agreed that there would not be much prospect of an immediate return, and the policy of the company would be to stimulate the demand and gradually build it up.

Mr. Wrottesley, K.C., cross-examining for a number of local authorities in the area, suggested that the proposed contract did not bind the Trust if, on further investigation, the area was shown likely to be unremunerative. In the meantime, the local authorities now supplying would be prevented from extending their areas of supply into the surrounding districts. Further, the new proposals put no compulsion on the promoters to bring forward schemes. Mr. Craig Henderson replied that there was nothing to prevent local authorities from bringing forward schemes if they could show that a supply was needed and the company was not giving it.

Mr. Rogers said that the capital of the Trust was £300,000. Already it had provided £250,000 for various schemes, and its reserves were about 40 per cent. of its nominal capital.

In reply to the Chairman, Mr. Craig Henderson said that it was obvious that the districts in which the greatest demand was likely to arise must be developed first, and the less likely districts would follow. The latter could only get a supply by the development in the first place of the former.

Mr. Moon, appearing for various local authorities, said that the clauses now produced would have the effect of holding up indefinitely the development of supply in the whole of the area included in the Bill and preventing districts getting supplies which could be given from the power stations belonging to local authorities. He contended that the clause compelling the promoters to bring forward a scheme within one year did not do what it purported to do, and that while nebulous schemes were being prepared by the promoters, the Electricity Commissioners could not consider schemes from the local authorities. The proposed contract between the company and the Trust would have no force.

The Chairman, referring to the clause binding the promoters to bring up schemes for areas where there was a reasonable prospect of the supply being remunerative, asked whether the promoters would agree to alter this to "a prospect of the supply being remunerative within a reasonable period." Mr. Craig Henderson said that the promoters would accept the amendment.

The Chairman subsequently said that the Committee found the preamble of the Bill proved subject to the financial arrangement being carried out, and also subject to the clauses being so worded as to ensure that the whole area would be supplied in a reasonable period with an adequate supply of electricity. The Committee then adjourned until May 23rd, when clauses were considered.

There was some discussion as to the form of the latter part of the clause dealing with the provision of an adequate supply within a reasonable time. As passed by the Committee, it provided that the proposals to be submitted should be so framed as to provide, to the satisfaction of the Commissioners, for an adequate supply being furnished within a reasonable time in those parts of the area of supply within which the company was empowered to distribute; that the scheme to be submitted should be so framed as to provide, to the satisfaction of the Commissioners, for transmission lines to be laid down throughout the area of supply; and that the proposals and scheme should be on such a scale that the estimated cost of carrying them into effect would be not less than £500,000. When the scheme had been approved by the Commissioners, it should be carried into effect within such reasonable time as determined by the Commissioners.

Coal Research.

On May 17th, Mr. Tinker asked what was the quantity of oil extracted per ton of coal treated by the Dr. Bergin's process; and asked for a comparison between that method and the low-temperature carbonisation process.

The Duchess of Atholl said that the crude oil and spirit obtained from one ton of suitable coal treated by the method amounted to from 110 to 135 gallons. In addition, a further unknown amount of coal was necessary for power and hydrogen production. The highest yields of dry tar and spirit, observed by the Fuel Research Staff, as obtained from the low-temperature carbonisation of ordinary coal in a large scale plant, was about 21 gallons, but the average bituminous coal would probably not yield more than about 15 gallons. Good quality cannel coal, of which, however, there was only a limited supply, might yield 50 to 60 gallons.

North Metropolitan Electric Supply Bill.

The Bill promoted by the North Metropolitan Electric Power Supply Co., authorising it to raise a further £1,000,000 of capital, together with further loan capital of £500,000, was considered by the Unopposed Committee of the House of Commons on May 19th, and was ordered to be reported for third reading.

Mr. W. Sidgwick said that the present authorised share capital of the company was £2,000,000, all of which was issued, and the authorised loan capital was £1,000,000, of which nearly £550,000 had been issued. He asked the Committee to report the Bill that evening, because the company wished to obtain Royal Assent to it before the Whitsun recess.

Trade Facilities Act Guarantees.

On May 16th the Chancellor of the Exchequer gave Sir F. Wise a statement showing the distribution among the various important industries of the £75,000,000 guaranteed under the Trade Facilities Act. The statement showed that the construction and equipment of electric railways accounted for 17 per cent. (£12,583,000); hydro-electric construction for 9.5 per cent. (£7,000,000); and other electrical works 10.8 per cent. (£8,004,600).

Hydro-Electric Works at Snowdon.

On May 19th Sir Robert Thomas asked the Minister of Transport whether his attention had been drawn to the fact that the hydro-electric works in the neighbourhood of Snowdon were causing disfigurement to the scenic beauties of the district by the erection of overhead transmission lines; and whether he would take steps to require the interests concerned to relay their cables in underground conduits.

Colonel Ashley said that such information as he had been able to obtain showed that the overhead lines were erected many years ago with the consent of the Board of Trade. In the event of any application being made to him for further overhead lines, the local authority would be given an opportunity of being heard before any such consent was given, but the desirability of securing all reasonable economy in the production and distribution of electricity was an important consideration, and he was not prepared to say in advance what his decision on any such application might be.

Electricity Schemes.

On May 17th, Colonel Burton asked the Minister of Transport whether he could give any information as to the progress of the preparation of schemes by the Electricity Board; if he could state whether any scheme was in preparation which would cover the rural areas of East Anglia; and, if so, when the publication of such scheme might be expected.

Colonel Ashley said that one scheme had already been prepared by the Electricity Commissioners, and published by the Central Electricity Board. He understood that a further scheme was in an advanced stage of preparation by the Commissioners and that they had other schemes in hand, but that the rural districts of East Anglia were not wholly covered by any of the schemes which the Commissioners were at present engaged in preparing.

Neon Electric Signs.

Varying Types of Neon Signs and some Interesting Data.

WE have received from Messrs. Philips Lamps, Ltd., some interesting data regarding neon signs, the salient features for which are claimed to be great penetrative power of the light obtained, small cost of upkeep, and an entire absence of anything approaching dazzle or heat. The vividness of the colour of neon lighting is such, it is claimed, that the sign stands out conspicuously from all other forms of illumination. It arrests attention and can be easily read from a great distance—even in foggy weather. The signs can be supplied in three different colours, red, blue, and green.

The efficient running is naturally a point of the greatest importance in exterior illumination, and in this respect Neon signs can be used with great advantage. The makers guarantee their tubes for one year, calculating a year to be equivalent to 1,800 burning hours. In actual practice this figure has been exceeded by 100 per cent. and more before it has been necessary to have the tubes re-filled with new gas. The patented construction and connection of the tubes assures, it is claimed, an absolutely steady light without the least flicker. Further, the tubes are not affected by continual incandescing and nigrescing, which is so detrimental to the apparatus, as special resistances are employed which give an efficient damping effect to the oscillations. The standard working pressure for the signs is 3,500 V, and the consumption of a 10-ft. length of 13-mm. tube is only 90 W. This diameter is normally used for the tubing, but special tubes are made of diameters varying from 7 mm. to 30 mm., the consumption varying accordingly. In addition to the ordinary type of neon sign, Messrs. Philips also manufacture box signs with tubes on one or both sides, as desired, in red, blue, or green, all the electrical accessories with the exception of the rotary convertor (if necessary) being contained in the box. Another form of sign is the "Mignon" Case sign, in which the tubes are worked off an induction

Neon Electric Signs.

coil connected to a 6 to 8-V supply. They will operate from an accumulator, or where an a.c. supply is available a low-pressure transformer is utilised. Here, again, tubes can be supplied giving red, blue, or green colours, in block or script formation as desired.

This form of sign is very much cheaper to produce than those previously mentioned, as no high-pressure transformers, resistances, &c., are necessary. Moreover the daylight appearance is greatly enhanced by the fact that the neon tubes are recessed in a wooden background, and all the necessary accessories are contained in the case, the whole forming an entirely self-contained sign.

The "Mignon" sign is particularly suitable for use above entrances to premises, shop windows, or show cases, and in all situations where a small and inexpensive sign is required. The accompanying illustrations show two types of neon signs which are produced by Messrs. Philips.

Correspondence.

***Correspondents should forward their communications as early as possible.** No letter can be published unless we have the writer's name and address in our possession.*

The Ideal Wiring System.

I have read with interest your numerous readers' views of ideal wiring systems, but I believe most will agree that the best system to be adopted depends, first, upon the premises to be wired; secondly, on cost; and thirdly, on efficiency.

For country houses and small estate buildings, lead-sheathed cables have proved a perfectly sound proposition; large numbers of contractors are using this method to-day, and are perfectly satisfied, except so far as bonding is concerned. The main objection, as some of your readers agree, has been the use of small screws and clips of various sizes.

To obviate this, some cable manufacturers recently have gone to the trouble of running a separate earthing wire under the sheathing, this wire being earthed to a common terminal on the base of the junction box. This, on the face of it, appears very well, and has possibly been thought out for use as their system, with their special junction boxes, but there is always the risk of the earth wire breaking through the insulation of one of the feed wires, on sharp bends, or the wire itself breaking, and I am convinced that most cable manufacturers will not adopt this unnecessary method of earthing lead-sheathed cables.

I have recently designed and patented a box eliminating the troubles mentioned by your readers, and although it is a recent production, it has met with favour from contractors generally, and I am receiving repeat orders. The "Bonfix" patent junction box was kindly described and illustrated in the ELECTRICAL REVIEW of March 25th, and the method adopted eliminates all screws. The adoption of spring clips, as part of the base, successfully bonds and fixes the cable in one operation by merely sliding the cable under the clips, the clips being made wide enough to accommodate a single-, 2- or 3-core cable.

If a cable with an earth wire is used, the earth wire is bound round the centre fixing screw under a washer, thus giving two independent bonds to each cable.

H. H. Leage,
SEFTON-FIDDIAN, LEAGE & CO.

London, *May 17th*, 1927.

We have followed the article on "The Ideal Wiring System" with much interest. As considerable users of C.T.S. and lead systems we have arrived at the conclusion that the most all-round satisfactory method is to combine the use of a liberal amount of slip tube with either. The conduit gives all the protection needed (and also the rigidity so desirable in various instances) when passing through walls and all hidden or doubtful places, and for protection from switches to ceiling we invariably use a length of conduit. Threading through joists does all the rest and enables the work to proceed expeditiously and safely. We think that C.T.S. treated thus, with a little careful planning, gets as near to the "ideal" as any reasonable person can require. Our opinion has frequently been endorsed by—among others—supply officials.

Wm. Paterson & Co.

Watford, *May 20th*, 1927.

Safety First: Earthing Transmission-line Towers.

Having found that tests published in the United States, in the National Electric Light Association's *Proceedings*, 1926, pp. 663-5, Vol. 83, are not yet available in some of our London technical libraries, I am led to call attention to them as of more than passing interest.

To determine whether the voltage drop along the surface of the ground near a three-conductor 120,000-volt transmission tower would be dangerous to life at the moment that one conductor becomes accidentally earthed on the tower, tests were made at low voltage and the results applied as follows:—

Test number	1	2	3
Figure number	12	13	14
At power house, 1st tower	Earthed	Earthed	Earthed
do. 1st Condtr.	,,	,,	,,
2nd tower	Not earthed	not earthed	not earthed

Possible earth current at moment 2nd cond't'r is accidentally earthed at	1st tower	2nd tower	3rd tower
Amperes	5,700	5,700	2,375
Calculated volts to earth	2,650	19,350	6,175
Volts through person leaning against tower...	1,590	12,600	4,550 to 6,175
Volts between a person's 2 feet on ground ...	300	3,000	1,300
	ft. in.	ft. in.	ft. in.
Scale 1 inch stated on figure equals	4 0	4 0	10 0
Square tower, measures	10 3	1 6	9 0
Test recorded, East ...	11 0	9 2	14 0
West ...	—	9 9	14 0
North ...	4 0	5 6	14 0
South ...	—	1 0	14 0

Presumably the same tower is represented in each test, and I venture to think scale on fig. 13 unlucky.

A favourite question of mine has been:—What practical value have you discovered for earth wires (against lightning) on overhead transmissions?

Here is a very substantial reason for installing earth wires, also for the efficient earthing of every tower. Setting their feet in concrete insulates them.

Theodore Stevens.

London, *May 10th*, 1927.

Sheath Losses in Cables.

With reference to Capt. Dunsheath's remarks, he will be interested to know that a bridge method has been developed for measuring the losses in a 3-phase 3-core system, both for the flat and triangular spacing

It is hoped to publish details of the method in due course.

R. A. Brockbank.
STANDARD TELEPHONES & CABLES, LTD.,
Research Laboratories.

London, *May 21st*, 1927.

Electric Power in Agriculture.

A letter in *The Times* on May 19th from Mr. W. W. Blair-Fish states that there are some very cold figures and estimates in a report "Electric Power in Agriculture" which Mr. Dampier Whetham presented to the Royal Agricultural Society in 1925. I have again read this report; valuable as it is in stating the position in 1924, I venture to suggest that it does not form a basis, to quote Mr. Blair-Fish, "to wait until the rural demand has become sufficiently urbanised to be self-supporting." I do not think it was in the mind of Mr. Dampier Whetham that further progress could not be made in electric machinery for the agricultural industry. He states: "I regard lighting as the chief function of electric current in country districts, and power as subsidiary"; further he states: "experience shows that at present electric ploughing is not usually convenient or a financial success." However, his figures show a demand of 9,000 to 12,000 units per square mile which can be obtained if suitable electrical agricultural machinery is provided.

At last year's Royal Agricultural Show at Reading I inspected a rotary cultivator; at a later date I obtained the opinion of a well-known agriculturist, who said it was a splendid machine and its effect on the land was remarkable. Dr. A. Ekström in his paper "Twenty Years' Practice in Rural Electrification" (Sweden), states that in Germany, lately, rotary tillers have aroused great interest. Major McDowall's system of conveying current from a point in the field to travelling electrical apparatus shows great promise. Mr. Dampier Whetham states that the demand for electric power for drying crops is likely to be small. The account in your journal of April 8th this year shows progress.

I have followed the beet sugar industry as a means of improving the load factor. The present method creates a demand for a short period of the year, but again there are hopes of improvement. The report on the De Vecchis beet sugar progress working in Italy is very encouraging; the process can be extended over 300 working days, instead of about 90 days, and further, it can be carried on in small units over a wide area, which would provide another demand for electric power.

If rural electrification is to be subsidised, let at least some of the funds go to improving electrical apparatus which will increase the load factor and assist the agricultural industry in reducing cost of production, and not delay progress until the rural areas grow into urban districts.

E. A. Mitchell.

Cuckfield, *May 21st*, 1927.

The Adequate Distribution of Electricity.

I should like to comment on several matters arising out of your issue dated May 13th. The first is the importance of the point put forward by Mr. E. E. Hamar in his article on "Publicity for Supply Undertakings," *viz.*, that ordinary people do not really know for what, and to what extent, they can use electricity. In this connection, the E.D.A. ballot competition did a great deal of good educational work.

The second is the note on inadequate distribution mains (p. 783). It is astonishing what a large number of consumers are not "allowed" by their electricity supplier to connect up cookers and heaters of over three kilowatts capacity. Coupled with these starved consumers are an enormous number of would-be users, who cannot obtain a supply "because no main is laid."

I know of central-station engineers who proudly point to stacks of cards, on which are recorded the names of prospective consumers, to whom it has been agreed to give a supply—but the station staff is entirely unable to cope with the work for many months to come. Under such circumstances it would seem wise to call in the assistance of a contractor, for it is not merely a question of adding to the station load, but also one of moment to the electricity industry generally as a means of increasing the sales of materials and apparatus. Further, these unconnected "consumers" are made an excuse for delaying rural extensions (this is, of course, where the shoe hurts my hobby).

In referring to the first scheme of the Central Electricity Board (p. 754), you mention that the Central Scotland area includes 4,980 square miles. My comment is: how few of those square miles, comparatively, will see a supply of electricity during the next decade, *unless* some radical change is made in bringing about an effective distribution network. By the way, both Fifeshire and Ayrshire can show (thanks to the enterprise of Messrs. Thompson and Bexon, each in his respective area) a very good example to most of the rest of Great Britain in the way of rural electrification.

The Central Electricity Board has as its chief object the production of cheap power—but this is not of much use unless it is effectively distributed, and that to an educated public. The amount of power mentioned as being the requirement of the Central Scotland area is far too little, if that district were only properly developed.

Hence I venture to submit the problem to your readers: "What is the best method of ensuring an adequate and universal distribution of electricity in Great Britain?"

R. Borlase Matthews.

Greater Felcourt, East Grinstead, *May 20th*, 1927.

A Commutation Problem.

With reference to the inquiry by Mr. A. O. Griffiths which appeared in your issue of May 6th, since the generators operate satisfactorily when new and for a short time after turning the commutators, the trouble would appear to be electrical and not mechanical, as if it were the latter it would always have existed and been noticeable.

It is quite possible that after turning slight sparking existed, not noticeable, and in small high-speed motors of this class it is difficult at times to locate the trouble, but a consideration of the following may help to solve the difficulty, having regard to the particulars that are available:—

(*a*) Since the trouble is more apparent after turning, it may be that the reduced diameter of the commutator, although small, has reduced the brush-contact area; if the current density of this has been pushed to the limit and perhaps over in the new machines as may happen in these small generators, good conditions exist when new, but as soon as this area is reduced, if ever so little, the density will be increased and disintegration of the brushes will take place; sparking will occur at an earlier period of use and will become more marked each time the commutators are turned. The current density of this area should not exceed 30 amps. per sq. inch.

(*b*) The contact area being reduced, the speed may be such as to give insufficient time for good commutation, and a coil not under commutation comes under the brushes.

(*c*) If the rotation is such that the toe and not the heel of the brush is against rotation, it is possible for heating to take place due to the smaller brush section at this point.

(*d*) It may be that during turning operations the commutator has moved slightly on the shaft.

As the conductors are evenly spaced around the armature and average 7½ deg. from the neutral position, the commutator must have moved, otherwise this condition has always existed; this, however, should be checked up electrically with a new machine when loaded to get this doubtful point settled.

A remedy for these conditions and to keep the cost of the machines down at the same time would be to increase the size of the commutator and so get a larger contact area; this could be taken up with the manufacturers.

P. Oaks.

Blackheath, *May 12th*, 1927.

A Mysterious Occurrence.

Can any of your readers account for the following?

On going to inspect a transformer house one Monday morning, after the usual week-end stoppage, we were surprised to find that the floor was flooded to a depth of four inches with oil from the transformer. An examination of the drainage tap showed that it had not been turned on, and it had not been disturbed, as it was thickly coated with dust, and a plug in the end of the mouth of the tap was also intact.

The transformer was still found to contain thirteen inches of oil, which we eventually drained off. After lifting the interior out, and cleaning the container, we carefully examined and tested the container for a leakage, but failed to find any; therefore we put the interior back again, filled up with fresh oil, and coupled the transformer up. It has now been working three weeks, and there is no sign of any further leakage.

The top is bolted down tightly with a packing ring between the lid and the edges of the container. The transformer is of 250 kVA, primary 2,500 volts, secondary 550 to 525 volts, periods 50, and holds about 200 gallons of oil. The old oil had been in use about 10 years.

I should like to hear some views on how this oil—over a hundred gallons—got out.

W. H. M.

May 16th, 1927.

Cheap Electricity.

Our attention has been drawn to a letter from Mr. R. Borlase Matthews which appeared in your issue of April 29th last, on the subject of your review of our pamphlet entitled "Cheapest Electricity—How to Obtain It."

We cannot allow to pass unchallenged the following statement:—

"This is, of course, a condensed version of a pamphlet by Mr. W. C. Mountain, entitled 'A Word in Favour of the Independent Power Plant.'"

Also the implied suggestion that, because Mr. Mountain is not disinterested in power plants, our announcement that the booklet in question was written by an independent electrical engineer is inaccurate. Nothing could be further from the truth, and we shall be glad if you will let your correspondent know this through the medium of your columns, seeing that we now give you—in confidence and not for publication—the name and address of the independent electrical engineer whose opinion is printed in the pages of our booklet.

Ruston & Hornsby, Ltd.
J. A. WALKER, *Advertising Manager.*

Lincoln, *May 16th*, 1927.

[We are satisfied that the pamphlet, "Cheapest Electricity," was written by an independent electrical engineer, of whose *bona fides* there can be no question.—EDS. ELEC. REV.]

Balancing Loads on Three-phase Services.

It would be of interest to know to what extent a supply authority can make regulations for balancing circuits on 3-phase supply. There appears to be some divergence of opinion on this point, and practice varies very much in different areas.

A case in point is one in which the supply company require all loads over 3 kVA to be balanced over the three phases, and on making inquiries the contractor was informed that the load on each phase must, for all practical purposes, be identical. The supply authority engineer even went to the length of asking that individual sections of the installation should be balanced in themselves, *e.g.*, both window and shop lights were to be balanced separately, and even a small load of 250 watts for use in lavatories and offices was to be divided over two of the phases. Further, as balancing is to be in watts, not points, will the supply company have the power, at a later date, to insist on a redistribution in the event of the ultimate wattage at various points differing from the wattage estimated during the erection of the installation?

Perhaps contractors or supply authorities, in districts where the distribution is three-phase, will state their experience on this point—though a legal opinion as to the supply authority's rights would be even more valuable.

E. Arthur Pinto.

Ramsgate, *May 16th*, 1927.

[Supply authorities have no legal right to make "regulations"; those issued by the Electricity Commissioners alone are valid. The only sound bases of refusal to connect an installation are (1) inadequate insulation resistance, and (2) reasonable ground for holding that the conditions obtaining on the applicant's installation would adversely affect the supply to other consumers. The official regulations have no reference to balancing loads.—EDS., ELEC. REV.]

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from the stated dates. In the case of foreign applications, the name and address of the British representatives are also given:—

May 11th.

Cadillac. No. 473,273. Class 6. Electric vacuum cleaning machines and parts thereof, and ventilating fans and parts thereof.—Clements Manufacturing Co., Chicago, U.S.A. (Lloyd, Wise & Co., 10, New Court, Lincoln's Inn Fields, W.C.2.)

Miniamp (lettering and design). No. 474,020. Class 8. Radio valves.—S. Hector, trading as the Miniamp Radio Valve Co., 329, High Holborn, W.C.1.

Uniflex. No. 471,506. Class 13. Reflectors.—Holophane, Ltd.

Stegolith. No. 473,202. Class 50. Electrical insulating substances, and electric insulators made therefrom, namely, holders, plates, sockets, handles, or other switch parts.—Steatit Magnesia Gesellschaft, Berlin. (Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2.)

May 18th.

Hatanic. No. 479,688. Class 5. Unwrought and partly wrought metals used in manufacture.—L.P.S. Electrical Co., Avenue Road, Acton, W.3.

Rotomag. No. 477,509. Class 6. Ignition apparatus for internal-combustion engines.—Joseph Lucas, Ltd.

Tefag, Berlin (lettering and design). No. 472,327. All goods in Class 8.—Die Telephon Fabrik Gesellschaft vormals J. Berliner, Berlin. (Abel and Imray, 30, Southampton Buildings, Chancery Lane, W.C.2.)

Siemens & Halske, S. & H. (lettering and shield design). No. 474,996. Class 8. Physical and electro-technical instruments and apparatus, Pupin coils, resistances, accumulators, &c. No. 475,000. Class 15. Glass. No. 475,001. Class 16. Porcelain and earthenware. No. 475,002. Class 17. Manufactures from mineral and other substances, for building or decoration. No. 475,011. Class 40. Goods manufactured from india rubber and guttapercha.—Siemens & Halske Gesellschaft, Berlin. (Hazeltine, Lake & Co., 28, Southampton Buildings, Chancery Lane, W.C.2.)

Celestion. No. 475,669. Class 8. Microphones, &c.—Electrical Manufacturing Co., Ltd., 29, High Street, Hampton Wick, Middlesex.

Noctoscope. No. 478,273. Class 8. Optical apparatus and instruments.—Television, Ltd. Motograph House, Upper St. Martin's Lane, W.C.2.

Long Life Lithanode, Our Slogan for 45 Years (lettering and design). No. 476,603. Class 8. Electric accumulators (not for medical purposes).—Lithanode Co., Ltd., 190, Queen's Road, Battersea, S.W.8.

Monette (lettering and design). No. 478,287. Class 8. Apparatus for use in radio-telegraphy and telephony.—Bruno Becker, trading as George Becker, 303-305, Edgware Road, London, W.2.

Jupiter. No. 476,515. Class 13. Electric lamps (ordinary), lamp holders, switches (ordinary), wall plugs, and other similar electric fittings.—Die Jupiter Licht Gesellschaft, Keisern & Brasch, Berlin. (Chatwin & Co., 253, Gray's Inn Road, W.C.1.)

Repex. No. 476,331. Class 50. A composition of asbestos and bitumen for use in sealing accumulators.—Chloride Electrical Storage Co., Ltd.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1925.

27,516. "Excavating channels for telephone and the like cables." J. A. Kirby. November 2nd, 1925. (269,681.)

29,982. "Processes and electrolytic methods for separating and recovering the constituents of metallic salts in a state of fusion for use in the treatment of ores or chemical or metallurgical products." E. A. Ashcroft. November 27th, 1925. (269,749.)

31,733. "Apparatus for announcing and indicating broadcasting and other wireless stations. A. A. Schaschke. December 16th, 1925. (269,792.)

1926.

31,847. "Motor vehicles for railways, tramways, or the like, specially applicable to electrically-propelled tramcars." J. P. Barker. December 17th, 1925. (269,951.)

2,088. "Safety device for the protection against overheating of electrical heating elements." A. L. Large. January 25th, 1926. (Cognate application, 21,230/26.) (269,969.)

2,354. "Construction of electrolytic or valve rectifiers and filtering apparatus for obtaining d.c. from a.c. supply mains for wireless receiving or transmitting apparatus and the like." A. Mathisen. January 27th, 1926. (Cognate application, 8,081/26.) (269,972.)

2,430. "Dry batteries." M. Van Koningsveld and Ever-Ready Co. (Great Britain), Ltd. January 27th, 1926. (269,977.)

2,569. "Protective arrangements for duplicate feeder electric systems." A. Reyrolle & Co., Ltd., R. W. Biks and J. Piquet. January 28th, 1926. (269,985.)

2,664. "Ignition magnetos for internal-combustion engines." British Lighting and Ignition Co., Ltd., and J. C. Hutton. January 29th, 1926. (269,986.)

2,751. "Clamps for welding electrodes or for contacts for electric switches." E. G. Budd Manufacturing Co. January 31st, 1925. (246,868.)

2,782. "Electric accumulators." E. Deodato. August 7th, 1925. (256,569.)

2,919. "Electric signalling systems employing carrier waves." Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). February 1st, 1926. (269,996.)

3,003. "Carrier-wave signalling systems." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). February 2nd, 1926. (270,001.)

3,013. "Electric switchgear." A. Reyrolle & Co., Ltd., and E. Waterhouse. February 2nd, 1926. (270,002.)

3,156. "Electrical insulators." Automatic Telephone Manufacturing Co., Ltd., and C. R. Woodland. February 3rd, 1926. (270,010.)

3,740. "Electric horns." North-East Electric Co. March 30th, 1925. (249,826.)

3,813. "Electrical condensers." T. S. Riley. February 10th, 1926. (270,020.)

4,357. "Appliances for starting, stopping, diverting, reversing and changing the direction of flow of electric current." G. H. Nedderman. February 16th, 1926. (270,023.)

4,416. "Telephone systems." Siemens Bros. & Co., Ltd., and W. H. Grinsted. February 16th, 1926. (270,026.)

4,705. "Thermionic valve amplifying systems." British Thomson-Houston Co., Ltd. March 3rd, 1925. (248,731.)

4,784. "Generators for electric arc welding." M. M. Irvine. February 19th, 1926. (270,032.)

5,192. "Electrically-heated kilns." B. J. Moore and A. J. Campbell. February 23rd, 1926. (270,035.)

6,198. "Protective systems for groups of rotary electrical machines." General Electric Co., Ltd., and A. E. Angold. March 5th, 1926. (270,043.)

6,571. "Variable-frequency variable-voltage converting apparatus." British Thomson-Houston Co., Ltd. March 10th, 1925. (249,118.)

7,032. "Electric tumbler switches." J. B. Tucker. March 15th, 1926. (270,048.)

7,888. "Electrical coil holders." I. Shapin. March 22nd, 1926. (270,058.)

8,081. "Regulators for dynamo-electric machines." W. H. Glaser and C. A. Vandervell & Co., Ltd. March 30th, 1926. (270,065.)

8,902. "Metering of calls of automatic telephone systems." Siemens Bros. & Co., Ltd., and H. E. Humphries. April 1st, 1926. (270,068.)

9,452. "Electric arc lamps." R. V. Boardman. April 9th, 1926. (270,070.)

9,506. "Multi-frequency crystal-controlled oscillator." Wired Radio, Inc. October 2nd, 1925. (259,174.)

9,547. "Sound amplifiers or loud speakers." C. N. Harrison. April 12th, 1926. (270,073.)

9,731. "Sound-reproducing apparatus." Hopkins Corporation. November 18th, 1925. (261,698.)

11,679. "Telephone transmitters." W. J. Rickets and E. E. Smith. May 3rd, 1926. (270,088.)

12,488. "Loud speakers." Gramophone Co., Ltd. May 14th, 1925. (252,194.)

13,367. "Apparatus for the control and operation of electric lifts and the like." J. B. M. Knutsen. May 26th, 1926. (270,098.)

13,936. "Electrolytic cells." A. K. Croad (Jessup & Moore Paper Co.). June 2nd, 1926. (270,104.)

14,149. "Mechanical connector for electrical purposes." E. Bawtree. June 4th, 1926. (270,106.)

15,167. "Coupling or connection of electrical wires and the like." L. H. Reid. June 16th, 1926. (270,110.)

16,982. "Electrical loud-sounding telephone." B. A. Butt. July 7th, 1926. (270,121.)

17,767. "Apparatus for electroplating." Dr. G. Caraccio. July 15th, 1926. (270,127.)

18,266. "Electric light fittings." R. W. Buckingham. July 21st, 1926. (270,130.)

19,869. "Electrically-heated hand irons." H. B. Jackson. August 12th, 1926. (270,139.)

21,057. "Chromium plating." Metropolitan-Vickers Electrical Co., Ltd. September 12th, 1925. (258,242.)

28,151. "Utilisation of ultra-violet rays for supporting combustion in heat engines and the like." H. A. Gill (Studienges fur Wirtschaft & Industrie). November 9th, 1926. (269,808.)

28,536. "Thermionic lamps." M. Balsera (Rodriguez). November 12th, 1925. (261,402.)

29,769. "Contact device for electric signalling apparatus." L. Rado and J. Modern. August 25th, 1926. (270,172.)

29,948. "Electric arc cutting." British Thomson-Houston Co., Ltd. (General Electric Co.). November 26th, 1926. (270,175.)

30,428. "Indicating devices." British Thomson-Houston Co., Ltd. December 1st, 1925. (262,432.)

30,701. "Means for drying electric bright annealing furnaces." Siemens-Schuckertwerke Ges. December 10th, 1925. (262,766.)

31,354. "Apparatus for automatically lighting electric lamps at any predetermined time." L. Mercier and V. Borgne. December 11th, 1925. (262,807.)

31,500. "Thermionic amplifiers, modulators, detectors, and like devices." Marconi's Wireless Telegraph Co., Ltd. December 12th, 1925. (262,820.)

31,610. "Railway signal systems." Automatic Telephone Manufacturing Co., Ltd., A. E. Hudd, and A. E. Tattersall. November 18th, 1925. (Divided application on 261,608.) (269,815.)

31,631. "Modulating systems for electrical high-frequency currents." C. Lorenz-Akt.-Ges. December 14th, 1925. (262,825.)

31,718. "Electric control systems." British Thomson-Houston Co., Ltd. December 18th, 1925. (263,150.)

32,312. "Method and means for the repetition of telegraphic signals." C. L. Hamel. December 24th, 1925. (263,800.)

32,603. "Switch devices for electric transmission lines." Metropolitan-Vickers Electrical Co., Ltd. January 13th, 1926. (264,478.)

1927.

2,442. "Manufacture of electric incandescent lamps and the like." General Electric Co., Ltd. (Patent Treuhand-Ges., für Elektrische Gluhlampen). January 27th, 1927. (270,210.)

3,219. "Electrically-driven railway ticket-printing press." Allgemeine Elektricitats Ges. February 4th, 1926. (265,604.)

3,554. "Apparatus for filtering electrical currents." Dubilier Condenser Co. (1925), Ltd. October 24th, 1924. (Divided application on 241,946.) (265,635.)

4,508. "Oil switches." Akt.-Ges, Brown, Boveri et Cie. March 29th, 1926. (268,305.)

4,583. "Electromagnetic sound reproducers, such as loud speakers." Brandes Laboratories, Inc. October 16th, 1926. (270,216.)

6,904. "Television systems and apparatus." J. L. Baird. October 21st, 1925. (Divided application on 269,219.) (270,222.)

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ABRAM.—Electric light installation, 50 houses, Bickershaw, for the U.D.C.; W. Aspinall, clerk.

ASPATRIA (Cumberland).—Church, for the Wesleyan trustees.

AYRSHIRE.—Shops and houses at Troon (£3,300); Wm. Govan & Sons, builders, Prestwick.

BARNSLEY.—Business arcade; J. R. Wilkinson, architect, 15, Regent Street. Hotel, for John Smith's Tadcaster Brewery Co., Ltd.; Bertram Wilson, Architect, High Street, Tadcaster.

BEDWAS AND MACHEN.—Housing scheme (40), for the U.D.C.; surveyor.

BLYTH.—Central School, Plessey Road; Education Committee.

BOURNEMOUTH.—Business premises and flats, Holdenhurst Road; H. J. Holt, Ltd.

BRIGHTON.—Operating theatre, &c., Royal Alexandra Hospital, Governors. Synagogue, Middle Street; Brighton and Hove Hebrew Committee. Alterations, 28, St. James Street; F. W. Woolworth & Co. Housing scheme, North Moulescombe Estate (184); borough surveyor.

BULGARIA (Sofia).—New slaughterhouses for the Town Council (100,000,000 leva). An international competition for plans and projects will be held.—*Reuter's Trade Service* (Sofia).

BURTON-ON-TRENT.—Extension of board room block, for the B.G.; R. S. Litherland, architect, 10, High Street.

CHELMSFORD.—First part of £91,000 county office scheme, Duke Street; Essex county architect.

CHESTER.—Housing scheme (26), Hoole Lane; C. Greenwood, city engineer, Town Hall.

CHESTERFIELD.—Baptist church, Cross Street, with heating and lighting (£9,400); Jackson & Fryer, architects; W. G. Kirk, Ltd., builders.

DERBY.—Hospital (£33,999), Friar Gate; J. W. Wildgoose and Sons, Ltd., builders, Matlock.

DOUGLAS (I. of M.).—Loch promenade improvement (£60,000); Corporation and Harbour Commissioners. Hall, corner Hanover Street and Lord Street; Salvation Army.

EDGEHILL (Devon).—Extensions to Girls' College, with electrical work, for the governors (£15,000); Rowntree, architect; Ellis & Sons, builders, Bideford.

EDINBURGH.—Warehouse and garage in Leith Walk; Danish Bacon and Co-operative Trading Co., Ltd. Secondary school, Leith Academy (£66,000), for the Burgh E.C.; Reid & Forbes, architects, 7, Ainslie Place.

FALKIRK.—School for Stirlingshire Education Authority; Master of Works, Education Authority, Stirling.

FERRYHILL.—Primitive Methodist church, with electrical work; T. W. T. Richardson, architect, Stockton-on-Tees; G. W. Lazenby & Co., Ltd., builders.

GLASGOW.—Warehouses in Sauchiehall Street for Messrs. Woolworth; the manager.

GOUDHURST.—Central school; Kent Education Committee.

GRAVESEND.—Improvments, Technical Institute, at School of Art; Kent Education Committee. Club, Overcliffe; Gravesend Trades Hall, Ltd.

GRAYS.—Re-erection of works, Thames Road (electrically equipped), (£30,000); Drums, Ltd.

HARROGATE.—Re-erection of portion of the George Hotel (several thousand pounds); Mr. Edge, manager. Police headquarters; P. O. Platts, County architect, County Hall, Wakefield.

HASTINGS.—Reconstruction of baths, with electrical work (£72,004), for the T.C.; borough surveyor. Entertainment hall, Gordon House, and lecture room, Buchanan Hospital; H. Ward & Sons, architects. Business premises, York Buildings, for McIlroy Bros., Ltd.; Callow and Callow, architects.

HAWARDEN.—Additional housing scheme (36), Penyffordd, for the R.D.C.; F. Barrett, surveyor, Wold House.

IRISH FREE STATE (Pembroke, Dublin).—Houses, Meleady's Field (77), Havelock Field (77), and Irishtown Road (29), for the U.D.C.

KEIGHLEY.—Secondary school for girls; West Riding Education Committee.

KEMPTON.—Filters and mains at Metropolitan Water Board works (£90,000).—W. Moss & Sons, Ltd.

KETTERING.—Dispensary and weights and measures offices, Market Street; Northants C.C.

KNARESBOROUGH.—Sanatorium, for West Riding C.C.; the clerk, County Hall, Wakefield.

LEEDS.—54 houses, York Road, 68, Meanwood Estate; city engineer.

LLAY (Denbighshire).—Housing scheme (200), for the Llay Main Colliery Co., Ltd.

LONDON (E.C.).—Extensions and alterations, engineer's department, Guildhall; City engineer. Extensions, Guildhall School of Music, for Corporation; L. & W. Whitehead, Ltd.

(Whitechapel, E.).—Buildings, 196-200, Commercial Road; A. T. G. Harbour for P. Young.

(Cricklewood, N.W.).—Aqueduct (£105,000); Metropolitan Water Board.

(Hendon, N.).—Bank and shops, Edgware Road and Station Road, Watling Estate; B. W. Blower.

(Bermondsey, S.E.).—Buildings, Saltpetre Works, Neptune Street, for Brandram Bros., Ltd.; J. Perkins & Sons, Ltd.

(Lewisham, S.E.).—Church and elementary school, Moorside Road, Downham; Roman Catholic authorities.

(Brixton, S.W.).—Trade school for girls, Clapham Road; L.C.C. Education Committee.

(Tooting Junction, S.W.).—Repertory theatre (£30,000), Mitcham Road, for the Furzedown Repertory Theatre Guild.

LUTON (Beds.).—Works extensions, for Vauxhall Motors, Ltd.

LYMINGTON (Hants.).—Additional 34 houses, for the T.C.; borough surveyor.

MANCHESTER.—Hospital for Manchester Northern Hospital for Women and Children; C. E. Marshall, secretary, 38, Barton Arcade. Infants' school, and alterations to Blackley Municipal School; S. Hey, director of education, Education Offices, Deansgate.

MUSSELBURGH.—Housing scheme (52), Monktonhall; burgh surveyor.

NEWHAVEN (Sussex).—130 bungalows, Telscombe and Saltdean, for the Peacehaven Estates Co.

NORTHANTS.—Mental hospital; County Hospital Committee.

OULTON.—Mental colony (£500,000); West Riding C.C.

PAISLEY.—Garage for J. McFadyen & Co., Ltd. (electric light and central heating); the manager.

PRESTWICH.—50 houses, Langley Estate, for U.D.C.; Titterington Bros. Housing scheme (76), for the T.C.; burgh engineer.

ROSS (Herefordshire).—Housing scheme (50), for the U.D.C.; E. R. Davies, clerk.

ROYSTON.—Extensions to hospital, with kitchen wing; B. Parker, architect, Norton Way, Letchworth, Herts.

SALISBURY.—Conversion of St. Edmund's College to municipal offices and council chamber (electric lighting); W. J. Goodwin, city engineer and surveyor, Municipal Offices.

SEVENOAKS.—Central school for boys; Kent Education Committee.

SHIRLEY.—66 houses and 52 garages, Wickham Road; Ivall Bros., Shirley Nursery, Wickham Road.

SIDCUP.—Secondary school; Kent Education Committee.

SITTINGBOURNE.—Grammar school, Borden, for Kent E.C.; W. H. Robinson, education architect, Sessions House, Maidstone.

SOUTHAMPTON.—Mental institution; medical officer of health.

STIRLINGSHIRE.—212 houses for County Council (£95,400); county clerk, Stirling.

STOKE-ON-TRENT.—44 houses, Goldenhill; city engineer.

SWANLEY.—Central school; Kent Education Committee.

SWANSEA.—Shops and cafe, Woodfield Street; D. Jones.

TAUNTON.—Five transformer sub-stations, for the T.C.; Ivor F. Shellard, borough engineer.

TENTERDEN.—Mental institution; Kent C.C.

TORQUAY.—Houses (238), Barton, for G. E. Tozer. Housing scheme (130), Windmill Hill, for the T.C.; borough surveyor.

TROON.—Housing scheme (104), with electrical work, for the T.C.; burgh surveyor. Shops and houses (£3,300), Dundonald Road; W. Govan & Sons, builders, Prestwick.

WALSALL.—Hospital (£30,890), for the T.C.; borough surveyor.

WARLINGHAM.—Nurses' home, Mental Hospital (£17,000), for Croydon Corporation; J. B. Edwards, Piccadilly.

WEDNESBURY.—Extensions, County Technical College, for Staffs. E.C.; education architect, Stafford.

WEST LOTHIAN.—Rebuilding Picturedrome after fire for Armadale Picturedrome Company; the secretary.

WREXHAM.—Additional 328 houses, for the R.D.C.; surveyor.